US Army Corps
of Engineers
New Orleans District
Mississippi Valley Division

Port of Iberia, Louisiana

Final Feasibility Report

OCTOBER 2006

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Appendix A - Economics

This Report Contains 6 Volumes

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INTRODUCTION

The Port of Iberia (POI) is located in south-central Louisiana and has been an important player in the offshore petroleum industry both in the Gulf of Mexico and other locations worldwide. Different segments of the offshore petroleum business have developed over the years at the Port of Iberia. One segment is the offshore service sector that routinely transports crews, equipment and supplies to the in place platforms in the Gulf of Mexico. Also an offshore rig and component fabrication sector has developed at the Port of Iberia. These port tenants have produced rigs, such as jackups, as well as components for larger structures. Their predominant activity today is producing topsides for large production platforms. Other port tenants support the offshore industry by supplying some of the basic parts needed by many segments of the industry. Pressure vessels used in component fabrication, corrosion resistant pipe used in the fabrication process and pipe used for sub sea delivery completion units are also manufactured and fabricated at the Port of Iberia.

As the petroleum industry moved offshore the most economically viable reserves were in near shore sites. Rigs and platforms were designed for this environment and generally were considered light and did not require navigation channels larger or deeper than those used for inland waterborne commerce. As these near shore reserves played out and fewer and fewer new reserves were being discovered in shallow water the offshore industry moved into deeper and deeper water. With breakthroughs in seismic and drilling technologies very deep water reserves became economically viable. New structures needed to economically extract the hydrocarbons from the deep-sea bottom are much larger and heavier than the traditional shallow rigs. These large structures required deeper access channels to reserve sites than traditional shallow water rigs.

Some of the Gulf coast ports that traditionally were leaders in rig component fabrication found themselves shut out of the deepwater market because of the relatively shallow Gulf access channels depth. The Port of Iberia is one such port. Facilities, infrastructure and skilled labor were already in place for fabricating deepwater topsides. Port residents discovered that the major producers would not consider bids submitted by POI fabricators without at least 20-foot access channel from the port to the Gulf. Given this situation the Port of Iberia requested the Corps of Engineers and the port enter into a cost sharing agreement to study deepening an access channel to the Gulf of Mexico so that port tenants could participate in the deepwater fabrication market. The following report presents the results of the Corps of Engineers, New Orleans District, and feasibility study economic analysis.

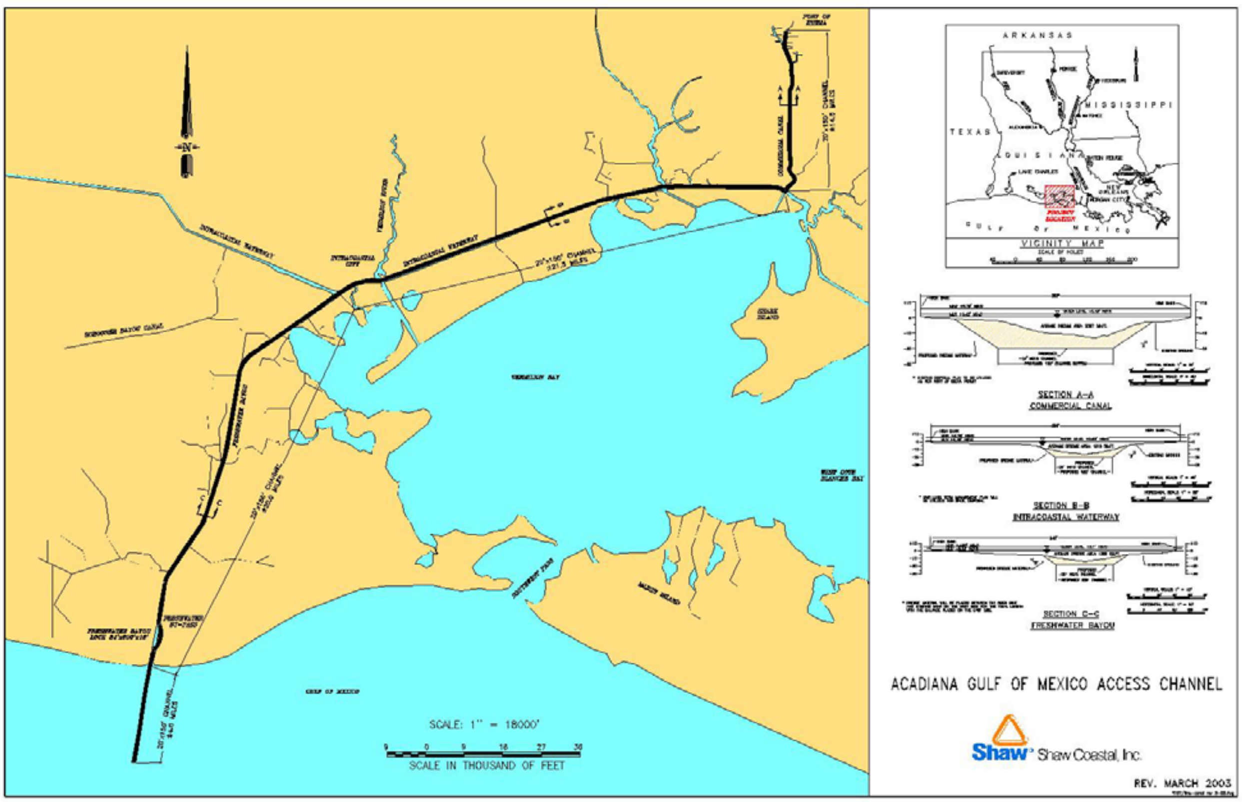
REPORT STRUCTURE

This report is laid out in three sections. Section 1 contains general information that pertains to all parts of the study. Section 2 delineates the methods, assumptions and calculations for the appropriations directed benefits for future fabrication contracts. Section 3 details the project costs and economic justification for the alternative with-project channel depths.

SECTION 1: General Information

DESCRIPTION OF PROJECT SETTING

The Port of Iberia (POI) study area, as shown in Plate E-1, is located at the inland terminus of the Commercial Canal in Iberia Parish in south-central Louisiana. The port is generally centered along the banks of Commercial Canal at a location approximately 7.5 miles north of the Gulf Intracoastal Waterway (GIWW), 9 miles north of Weeks Bay and 4.5 miles southwest of the City of New Iberia. The Port of Iberia is bounded by the cities of Lafayette and New Iberia to the north, the Mermentau Basin to the west, the Atchafalaya River Basin to the east, and the Gulf of Mexico to the south. Major communities in the study area include New Iberia, Lafayette, Jeanerette, Franklin, Abbeville, and numerous smaller communities. The project area will include the Port of Iberia, Commercial Canal, GIWW (Commercial Canal to Freshwater Bayou), and Freshwater Bayou out to the -20 foot contour in the Gulf of Mexico. The Commercial Canal is 13 feet deep and 125 feet wide and extends from the Port of Iberia near New Iberia, Louisiana, to the Gulf Intracoastal Waterway.



GULF INTRACOASATAL WATERWAY

The Gulf Intracoastal Waterway (GIWW) is a major inland route for waterborne commerce in the United States. The GIWW has a 12-foot deep by 125 feet wide navigation channel and provides interstate east-west passage across the Gulf States from Apalachicola, Florida to Brownsville, Texas. The Port of Iberia is located approximately 8 miles north and inland from the junction of the Commercial Canal and the GIWW. Deepwater access from the GIWW to the Gulf of Mexico is available to the east at the Mississippi River and to the west at the Calcasieu River at distances of approximately 140 and 100 miles, respectively. Within the study area, shallow draft access to the Gulf of Mexico is available through the Freshwater Bayou, the Acadiana Navigation Channel, the Vermillion River Cutoff and Bay Channel, and the Atchafalaya River. At present, the primary restriction to east-west passage along the GIWW exists at the LA Highway 317 bridge at Bayou Sale. This bridge poses a height limitation of approximately 73 feet, and a width limitation of 125 feet, which restricts the transport of large equipment from within the port.

ATCHAFALAYA RIVER (MORGAN CITY)

The Atchafalaya River is located at the eastern perimeter of the study area. The river provides a 20-foot deep by 200-foot wide channel from the GIWW to the Gulf, and is extensively used for the transport of offshore rigs and platforms. The use of this channel for the movement of large structures from the POI area is prohibited by the 73 feet height restriction at the Bayou Sale Bridge and the 12-foot draft of the accessing waterways.

ACADIANA NAVIGATION CHANNEL

The Acadiana Navigation Channel (ANC) is located within the central region of the study area and provides access from the GIWW, through Vermilion Bay, to the Gulf of Mexico. North of the GIWW, the Commercial Canal serves as an extension of the ANC and as the main artery of the Port of Iberia. The ANC, which is extensively used for offshore commercial shipments from the Port of Iberia, provides a 9-foot deep by 200-foot wide channel. The depth of the ANC is currently limited to a maximum of 9 feet by the USACE permit [SW (Vermillion Bay) 605] that authorized its construction and maintenance.

VERMILION RIVER CUTOFF

The Vermillion River Cutoff is located southeast of Intracoastal City, Louisiana and provides a channel between the GIWW and the northwest corner of Vermilion Bay. From this location, the Vermillion Bay Channel provides a channel to the Gulf through Southwest Pass. The Vermilion River Cutoff is a Federal project, which has been authorized since 1941. The authorized depth and width of the channel is 8 feet and 80 feet, respectively; however, the actual depth and width are greater, with the reported depth in 1988 of some portions being 13 feet. The Vermilion Bay Channel has an average depth of 10 feet, except for a section near the northern terminus of the Cutoff, which has historically suffered from problems of silt deposition that limit depths to 8 feet. While there are no height restrictions within the Vermilion River Cutoff/Vermilion Bay

Channel route to the Gulf of Mexico, the size of packages that may be transported are limited by the 8 foot depth.

FRESHWATER BAYOU CANAL

Freshwater Bayou Canal is located at the western boundary of the study area, approximately 25 miles southwest of the Port of Iberia, and provides direct access from the GIWW to the Gulf. Constructed in 1968 as a Federal project to prevent saltwater intrusion, the Canal provides a 12 foot deep by 125 foot wide channel, which terminates at a lock structure at the Gulf. The lock structure has a width of 84 feet and a controlling depth of 12 feet. In order to accommodate the passage of oversized vessels, a 125-foot wide by 12 feet deep bypass channel with removable closure structures at each end was constructed in 1986. The Abbeville Harbor and Terminal District (AHTD) operates the bypass channel.

ADDDITIONAL WATERWAYS IN THE ECONOMIC SPHERE OF INFLUENCE

Other waterways in the regional support the offshore petroleum industry with services and fabrication of topsides. These include: 1) Houma Navigation Canal to the east of POI which is an authorized 15 foot deep channel from the intersection of the GIWW at Houma Louisiana to the Gulf of Mexico; 2) La Quinta Channel is 45-foot deep, located in Texas in the Corpus Christi area; and 3) The Corpus Christi Channel is a 45-foot deep channel located in Corpus Christi, Texas.

SPECIAL CONSIDERATIONS FOR THIS ANALYSIS

In May of 2005, Public Law 109-13, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005 was enacted, which states the following:

> ***OFFSHORE OIL AND GAS FABRICATION PORTS***
> ***SEC. 6009. In determining the economic justification for navigation projects involving offshore oil and gas fabrication ports, the Secretary of the Army, acting through the Chief of Engineers, is directed to measure and include in the National Economic Development calculation the value of future energy exploration and production fabrication contracts and transportation cost savings that would result from larger navigation channels.***

Under the legislation the full monetary value of any contract awarded to the Port of Iberia, for the deepwater fabrication of offshore exploration and production equipment, is included in the calculation of benefits. Furthermore, any benefit using Deepwater Fabrication contracts is to be counted as a benefit for project justification regardless if work was displaced from foreign or domestic yards.

SECTION 2: Appropriations Directed Benefits for Future Fabrication Contracts

OVERVIEW

As discussed in Section 1 of this appendix, the methodology used to measure benefits for this analysis is based on legislative language included in Public Law 109-13, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Tsunami Relief, 2005. As a result, the Corps of Engineers was directed to measure benefits as the full value of the contracts that a port is expected to win regardless of whether the fabricated component would have otherwise been constructed in a foreign location or in another domestic location.

This legislation has implications for the Port of Iberia analysis because under NED benefits measured in accordance with P&G, explained in ER 1100-2-100, the appropriations directed benefits using Deepwater Fabrication contracts described in this analysis would represent regional economic benefits (RED) and not NED benefits. This is due to the fact that the contracts that fabricators from the Port of Iberia are expected to win, with a deeper channel, will be at the expense of other domestic fabricators. Consequently, even though the Port of Iberia and surrounding areas will benefit economically from increased activity, from a national perspective there is no net increase in overall economic development.

BACKGROUND AND PURPOSE

The Port of Iberia (POI) is located in south-central Louisiana on a channel that provides 12 feet of depth access to the Gulf of Mexico (GOM). There are three fabrication facilities at the Port that historically have been involved in the construction of jackets and topsides for oil and gas production platforms in the GOM and in foreign markets. These are Omega Natchiq, Dynamic Industries, and Midland Fabrication (formerly Unifab).

These facilities operate within a regional complex of fabrication facilities that are involved in offshore production platform construction. These include: 1) Gulf Island Fabrication, which is located in Louisiana on the authorized 15-foot deep Houma Navigation Canal to the east of POI; 2) McDermott, which is located in Louisiana on the 20-foot deep Atchafalaya River to the west of POI; 3) Kiewit, which is located in Texas on the 45-foot deep La Quinta Channel in the Corpus Christi area; and 4) Gulf Marine, which is part of the Paris-headquartered international firm Technip and is located in Texas on the 45-foot deep Corpus Christi Channel.

With the move toward deepwater oil and gas exploration and production in the GOM and worldwide, the fabricators in Louisiana are finding it increasingly difficult to fully participate in the emergent deepwater markets because of channel dimensions that are not conducive to the transport of the larger and heavier deepwater platforms. As a consequence, modifications are being considered for the channels in Louisiana, including an increase to 20-foot depth to the POI channel and an increase to 35 feet for the Atchafalaya River (Morgan City).

This analysis focuses on the international and domestic markets for deepwater production platforms over a 50-year period of analysis and allocates market share by dollar value to the POI fabricators in terms of possible scenarios that can be used by decision makers to evaluate the viability of the project.

The topsides market is evaluated by world region and by platform type using the four technological forms that have emerged for deepwater production (see Figure 1):

1. Floating Production System (FPS) – consists of a semi-submersible unit that is equipped with drilling and production equipment. It is anchored in place with wire rope and chain, or can be dynamically positioned using rotating thrusters. Production from subsea wells is transported to the surface deck through production risers designed to accommodate platform motion.

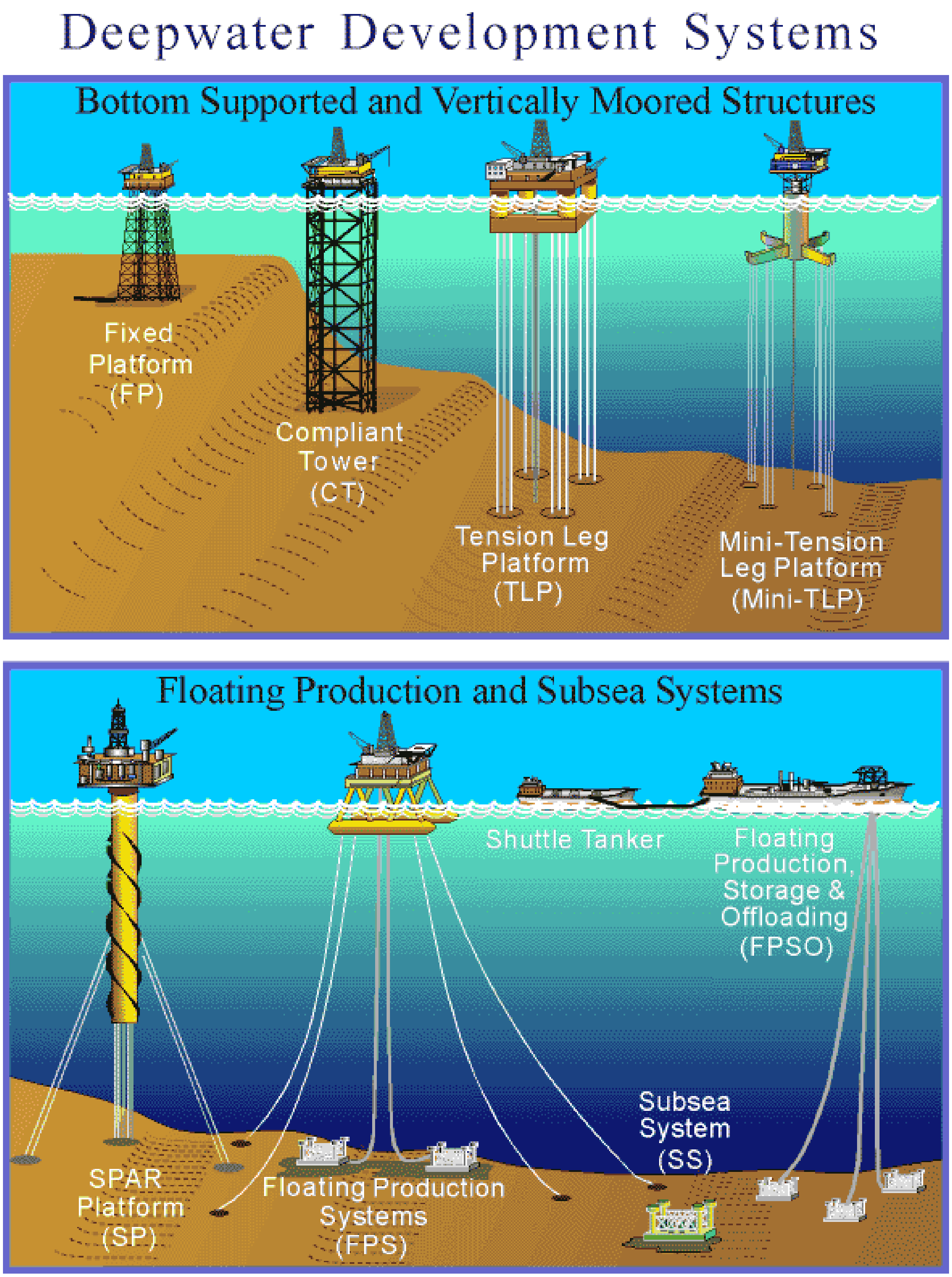
2. Floating Production, Storage and Offloading System (FPSO) – consists of a large tanker type vessel moored to the seafloor. An FPSO is designed to process and store production from nearby subsea wells and to periodically offload the stored oil to a smaller shuttle tanker, which then transports the oil to an onshore facility for further processing.

3. Spar Platform (Spar) – consists of a large-diameter single vertical cylinder supported by a deck. It has a typical fixed platform topsides (surface deck with drilling and production equipment), three types of risers (production, drilling, and export), and a hull that is moored using a taut cantenary system of six to 20 lines anchored into the seafloor.

4. Tension Leg Platform (TLP) – consists of a floating structure held in place by vertical, tensioned tendons connected to the seafloor by pile-secured templates. The tensioned tendons assure limited vertical motion.

The potential POI share of the market for topsides for these four facility types is evaluated against the background of: 1) an analysis of the development of production platforms in the GOM and worldwide, with an emphasis on deepwater platforms and the participation of GOM fabricators in shallow water and deepwater projects worldwide; 2) a description of the POI and other GOM fabrication yards and their capacity and experience, along with some indication of the dimensions and operations of foreign yards; 3) a presentation of the best available information from public and private sources on total and deepwater oil and gas worldwide and in the GOM, with special emphasis on production curves; 4) public agency and private sector analyses of short-term and long-term markets for production platform topsides, including a special analysis that was commissioned for this study; and 5) an analysis of the competitive environment of POI fabricators based on interviews with the major fabricators in Louisiana and Texas.

Figure 1. Deepwater Development Systems



Source: Minerals Management Service

HISTORICAL DEVELOPMENT

Oilfield Publications Limited's three-volume *The World Offshore Field Development Guide* along with the separate *The North Sea Field Development Guide* provide a comprehensive picture of the development of offshore oil and gas fields worldwide, including whether production is subsea or surface and, in the case of platforms, the characteristics of the platform and the water depth in which it is located.

This is the only data source that provides information on the yards in which jackets/bases and decks/topsides were fabricated. This information enables a clear insight into the penetration of GOM fabricators into foreign markets and the penetration of foreign fabricators into the GOM market. It is not definitive in the sense that main contractors for jackets/bases and decks/topsides are listed, which does not include the many participants (as component suppliers) in any particular job.

GULF OF MEXICO

Comprehensive information on the fields in the GOM is contained in the volume on *The Americas* and is restricted to platforms and subsea completions in water depths approximately 150 meters (500 feet) or greater. This was an arbitrary cutoff point necessitated by the huge number of facilities in the GOM. A pocket CD ROM contains information on an additional 6,000 fields, but this information does not include identification of the jacket/base or deck/topsides fabricators.

Table 1 lists alphabetically the platforms described in the GOM section of *The Americas* report that are located in water depths ranging from approximately 150 meters to 305 meters (that is, from approximately 500 feet to approximately 1,000 feet). All of these are conventional platforms with legs resting on the bottom. As can be seen from the table, neither the jacket/bases nor the deck/topsides of any of these platforms were constructed in fabrication yards outside of the U.S. Within the U.S., the fabrication of jackets/bases and decks/topsides is fairly evenly distributed between yards in Louisiana and Texas, with heavy participation by McDermott and Gulf Marine Fabricators. All of the references to Gulf Marine are to the same facility under different ownership. Brown & Root is no longer in the platform fabrication business. The table indicates that intermediate water depths have not been a source of foreign competition, but have been a source of competition among fabricators in Louisiana and Texas.

Table 1. Intermediate Depth GOM Platforms

Designation	Year of Installation	Type	Water Depth (meters)	Jacket/Base Weight (metric tonnes)	Deck/Topsides Weight (metric tonnes)	Jacket/Base Contractor	Deck/Topsides Contractor
Alabaster	1991	Steel	143	4,650	2,050	McDermott Marine, Harbor Island, TX	McDermott, New Iberia, LA
Boxer	1987	Launch	229	13,500	6,500	McDermott	Avondale Shipyard
Cerveza	1981	Launch	285	18,100	NA	McDermott	McDermott
Cerveza Ligera	1982	Launch	282	13,600	7,400	McDermott	McDermott
Chinook Tripod 1	1999	Steel	164	NA	NA	Twin Brothers, LA	Twin Brothers, LA
Cinnamon A	1998	Steel	204	5,500	1,500	J. Ray McDermott, Morgan City	Unifab, New Iberia (deck), Morrison (production skid)
Crystal	1991	Steel	189	7,000	700	McDermott, Amelia/New Iberia, LA	McDermott, Amelia/New Iberia, LA
Enchilada A	1997	Lift	192	7,100	4,400	Aker Gulf Marine, Aransas Pass (jacket/piles)	Gulf Island, Houma (deck)
Ewing Bank 826A	1988	Launch	146	NA	NA	McDermott, Bayou Boeuf, LA	McDermott
Ewing Bank 910	1998	Steel	170	5,700	2,300	Aker Gulf Marine, Aransas Pass, TX	Unifab, New Iberia
Garden Banks 191	1993	Steel	219	NA	NA	USA	USA
Garden Banks 236A	1979	Steel	208	12,000	NA	Brown & Root	Brown & Root
Green Canyon 18A	1986	Launch	232	15,200	5,200	Gulf Marine Fabricators, Ingleside, TX	Gulf Marine Fabricators, Ingleside, TX
Kilauea	1989	Steel	190	NA	NA	Texaco/McDermott	USA
Lobster	1994	Steel	236	15,000	4,500	Aker Gulf Marine, Ingleside, TX	Aker Gulf Marine, Aransas Pass, TX
Marquette A	1989	Steel	187	NA	NA	Gulf Marine Fabricators, Ingleside, TX	Gulf Marine Fabricators, Ingleside, TX
Marquette CPP	1989	Steel	188	NA	NA	Gulf Marine Fabricators, Ingleside, TX	Gulf Marine Fabricators, Ingleside, TX
Miss. Canyon 148A	1980	Steel	198	9,280	NA	Brown & Root, Greens Bayou/Harbor Island	Brown & Root, Greens Bayou/Harbor Island
Miss. Canyon 486A	1990	Steel	177	NA	NA	McDermott	McDermott
Phar Lap	1995	Steel	205	NA	NA	USA	USA
Salsa	1997	Steel	210	9,000	2,250	J. Ray McDermott, Morgan City	Aker Gulf Marine
Snapper	1986	Launch	263	18,600	NA	McDermott	McDermott
South Pass 52A	1991	Lift	162	2,750	1,074	McDermott	McDermott
Spectacular Bid A	1995	Steel	160	NA	NA	USA	USA
Spirit A	1998	Launch	220	8,800	NA	Aker Gulf Marine, Ingleside, TX	Unifab, New Iberia, LA
Tequila	1984	Launch	201	6,300	1,900	Brown & Root, Harbor Island, TX	Brown & Root
Tick	1991	Launch	219	10,000	2,000	Gulf Island Fabrication/Microperi (JV), Houma	Twin Brothers Marine, New Iberia, LA

Notes: Steel = Steel jacket, installation method not specified
Lift = Steel jacket, lift installed
Launch = Steel jacket, barge launch installed

Source: Oilfield Publications Limited, 2004 (Fourth Edition), *The World Offshore Field Development Guide, Volume 3, The Americas.*

Table 2 lists alphabetically the 39 platforms located in the GOM in water depths greater than 305 meters. As can be seen from the table, there is small participation of foreign fabricators in the deepwater GOM deck/topsides market and dramatic participation of foreign fabricators in the GOM deepwater jacket/base market.

With respect to the deck/topsides market, there is competition among all of the major fabricators in Louisiana and Texas. McDermott leads the way, with participation in 20 projects, including two at its Vera Cruz, Mexico facility. It is followed by: (1) Gulf Marine in Texas, with participation in nine projects; (2) Gulf Island in Houma, with participation in five projects; (3) Omega Natchiq at POI, with participation in one project; and (4) the Kiewit yard at Ingleside, with participation in one project.

Table 2. Deepwater GOM Platforms

Description	Year of Installation	Type	Water Depth (meters)	Jacket/Base Weight (metric tonnes)	Deck/Topsides Weight (metric tonnes)	Jacket/Base Contractor	Deck/Topsides Contractor
Allegheny	1999	Mini-TLP	1,008	NA	NA	Gulf Island Fabrication, Houma, LA	Gulf Island Fabrication, Houma, LA
Amberjack	1991	Launch	313	21,600	3,900	Gulf Marine Fabricators, Corpus Christ, TX	Brown & Root, Greens Bayou, TX
Atlantis	2005	Semisubmersible	1,829	NA	NA	Daewoo Heavy Industries, Okpo, South Korea (hull)	McDermott, Morgan City, LA
Auger	1994	TLP	872	20,000	12,700	Belleli, Taranto, Italy (hull)	McDermott (deck); Aker Gulf Marine (templates/quarters)
Baldplate	1998	Compliant Tower	503	25,847	3,582	J. Ray McDermott (tower base/piles); Aker Gulf Marine (tower)	Aker Gulf Marine
Boomvang	2002	Truss Spar	1,053	10,000	5,600	Aker Mantyluoto, Pori, Finland	McDermott (deck); Houma Industries (production packages)
Brutus	2001	TLP	910	12,245	19,955	Daewoo Heavy Industries, Okpo, South Korea	J. Ray McDermott, Amelia (deck/five modules)
Bullwinkle	1988	Launch	411	49,375	6,000	Bullwinkle Construction (GMF/Kaiser Steel JV), Ingleside Point	McDermott Marine Construction
Cognac	1978	Launch	313	30,500	NA	McDermott	McDermott
Cooper	1995	Semisubmersible	668	NA	NA	HAM Marine, Pascagoula, MS (rig conversion)	HAM/McDermott (topsides modifications)
Devils Tower	2003	Truss Spar	1,710	NA	NA	McDermott, Batam Island, Indonesia	McDermott TNG Shipyard, Veracruz, Mexico
Front Runner	2004	Truss Spar	1,066	NA	NA	McDermott, Jebel Ali, UAE	Gulf Island Fabrication, Houma, LA (subcontracted from McDermott)
Genesis	1998	Spar	780	29,000	16,000	Rauma Offshore Contracting, Pori, Finland	J. Ray McDermott, Morgan City; Southport Inc. (quarters)
Gunnison	2003	Truss Spar	960	12,500	NA	Technip Mantyluoto Works Oy, Pori, Finland	Gulf Island Fabrication, Houma, LA
Holstein	2003	Truss Spar	1,324	NA	NA	Technip Mantyluoto Works Oy, Pori, Finland (hard tank); Gulf Marine Fabricators, Ingleside, TX (truss)	McDermott, Morgan City, LA
Hoover	1999	Spar	1,463	35,400	16,000	Aker Rauma Offshore, Mantyluoto, Finland	Brown & Root, Greens Bayou, TX
Horn Mountain	2002	Truss Spar	1,647	37,000	NA	Technip Mantyluoto Works Oy, Pori, Finland	Gulf Marine Fabricators, Ingleside, TX
Jolliet	1989	TLP	536	NA	NA	Far East Levingston Shipbuilding, Pioneer Yard, Singapore	Far East Levingston Shipbuilding, Main Yard, Singapore
Lena	1983	Compliant Tower	305	NA	NA	Brown & Root, Port Aransas, TX	McDermott (deck); Enstar Engineering (modules)
Mad Dog	2003	Truss Spar	2,055	NA	NA	Technip Mantyluoto Works Oy, Pori, Finland	McDermott, Morgan City (topsides); TBA (quarters)
Magnolia	2004	TLP	1,425	NA	NA	Samsung Heavy Industries, South Korea (hull)	Gulf Marine Fabricators, Ingleside, TX (topsides)
Marco Polo	2003	TLP	1,311	NA	NA	Samsung Heavy Industries, South Korea	Kiewit Offshore Services, Ingleside, TX (piles, tendons, topsides)
Marlin	1999	TLP	979	9,000	6,500	Belleli, Taranto, Italy	Aker Gulf Marine, Corpus Christi, TX
Mars	1996	TLP	896	15,560	14,940	Keppel Fels, Singapore	Gulf Marine Fabricators, Ingleside, TX
Matterhorn	2003	Mini-TLP	869	5,440	6,060	Keppel Fels, Singapore	Gulf Marine Fabricators, Ingleside, TX
Medusa	2003	Truss Spar	677	NA	NA	McDermott, Jebel Ali, UAE	McDermott TNG, Veracruz
Morpeth	1998	Mini-TLP	518	2,500	4,000	Gulf Island Fabrication (hull)	Gulf Island Fabrication (deck); Hanover (separation equipment)
Na Kika	2003	Semisubmersible	1,920	18,000	18,000	Hyundai Heavy Industries, Ulsan, South Korea	Hyundai Heavy Industries, Ulsan, South Korea
Nansen	2002	Truss Spar	1,122	NA	NA	Aker Mantyluoto, Pori, Finland	McDermott (deck); Houma Industries (production packages)
Neptune	1996	Spar	588	11,000	4,500	Rauma Offshore Contracting, Pori, Finland	J. Ray McDermott, Morgan City
Petronius	1998	Compliant Tower	535	30,000	8,000	J. Ray McDermott, Morgan City (tower)	Gulf Island Fabrication, Houma (deck/intergration)
Pompano	1994	Launch	393	NA	NA	McDermott, Harbor Island/Morgan City	McDermott, Morgan City
Prince	2001	Mini-TLP	454	NA	NA	Amfels, Brownsville, TX (hull); Aker Gulf Marine, Ingleside, TX (tendons/piles)	Omega Natchiq, New Iberia (deck/topsides)
Ram-Powell	1997	TLP	981	15,000	NA	Belleli, Taranto, Italy	McDermott, Morgan City
Red Hawk	2004	Cell Spar	1,615	NA	NA	Gulf Marine Fabrication, Ingleside, TX	Gulf Marine Fabricators, Ingleside, TX
Thunder Horse	2005	Semisubmersible	1,859	120,000	40,000	Daewoo Shipbuilding, Okpo, South Korea	McDermott, Morgan City
Typhoon	2001	Mini-TLP	639	NA	NA	J. Ray McDermott, Morgan City	J. Ray McDermott, Morgan City
Ursa	1999	TLP	1,050	28,000	35,000	Belleli, Taranto, Italy	J. Ray McDermott, Morgan City (modules)
Virgo	1999	Launch	344	22,675	4,000	Aker Gulf Marine, Ingleside, TX	Aker Gulf Marine, Ingleside, TX

Note: The weight numbers for the Na Kika are apparently in error.

Source: Oilfield Publications Limited, 2004 (Fourth Edition), *The World Offshore Field Development Guide, Volume 3, The Americas*, with modifications based on Marshall DeLuca, "Deep Developments Taking Shape" (*Offshore Engineer*, April 2, 2003) and Marshall DeLuca, "The World in Depth" (*Offshore Engineer*, April 1, 2004).

The only deck/topside constructed by foreign yards was the Jolliet TLP by Keppel Fels in Singapore (installed in 1989) and the Na Kika semi submersible by Hyundai in South Korea (installed in 2003). The Jolliet TLP has columns measuring 46.2 meters by 12.2 meters and a deck measuring 42 meters by 54 meters. Details on the project and how it was transported to the U.S. are not readily available.

The Na Kika semi submersible includes subsea components and was the largest and most elaborate deepwater facility until the arrival of the Thunder Horse in 2005. The Na Kika has a length of 81.2 meters and a height of 55 meters and weighs 31,500 metric tonnes (according to Dockwise's cargo description). It was transported from Ulsan, South Korea, to the Kiewit yard at Ingleside on a 57-day voyage aboard Dockwise's *Mighty Servant 1*. Kiewit served as the host readiness site.

There is heavy participation of foreign yards in the GOM deepwater jacket/base market, particularly with respect to the new platform types that have been developed specifically for deepwater. Of the 39 platforms, the jackets/bases of the six located in the shallowest water were all constructed by U.S. fabricators, including five conventional platforms (Amberjack, Bullwinkle, Cognac, Pompano, and Virgo) and the Lena Compliant Tower. If the five are subtracted from the 39, there are eight remaining that were constructed in the U.S. (Allegheny, Baldplate, Cooper, Lana, Petronius, Prince, Red Hawk, and Typhoon) and 26 that were constructed in foreign yards.

The nomenclature of many of the yards is deceptive because the industry is characterized worldwide by constant changes of ownership. The Aker facilities at Ingleside and Pori were acquired by Coflexip, which joined with Technip to form Technip Coflezip and now operates under the name of Technip. There is only one Gulf Marine fabrication yard at Ingleside and only one Mantyluoto yard at Pori (including the Rauma designations), and both of these are owned by Technip. The various projects conducted at Ingleside and Pori was all constructed by the same foreign-owned companies in a line of succession.

Gulf Marine and McDermott constructed the jackets for the five conventional platforms, in continuity with the intermediate water depth platforms. The deepest is Bullwinkle, whose jacket was constructed in 1988 in 411 meters of water through a Gulf Marine/Kaiser Steel joint venture. The total height is 492 meters, with a jacket 416 meters high. The deck is 62.5 meters by 56.4 meters. Bullwinkle is generally considered to have reached the technical and economic frontier for fixed platforms. There is no evidence of foreign competition for deepwater conventional platforms in the GOM.

Three Compliant Towers have been installed in the GOM: (1) Lena in 1983 in 305 meters of water; (2) Baldplate in 1998 in 503 meters of water; and (3) Petronius in 1998 in 535 meters of water. These are the only three Compliant Towers that have been completed worldwide. GOM fabricators constructed all the towers and topsides. The Baldplate is the tallest freestanding structure in the world, at 579.7 meters from seabed to top of flare. Compliant Towers are structurally fairly similar to conventional platforms, and there is no evidence of foreign competition for Compliant Towers in the GOM.

There are nine Tension Leg Platforms in the deepwater GOM: (1) Magnolia in 2004 in 1,425 meters of water; (2) Marco Polo in 2003 in 1,311 meters of water; (3) Ursa in 1999 in 1,050 meters of water; (4) Ram-Powell in 1997 in 981 meters of water; (5) Marlin in 1999 in 979 meters of water; (6) Brutus in 2001 in 910 meters of water; (7) Mars in 1996 in 896 meters of water; (8) Auger in 1994 in 872 meters of water; and (9) Jolliet in 1989 in 536 meters of water. The topsides of all of these structures were fabricated by GOM yards, with the exception of Jolliet, which was constructed entirely by Keppel Fels in Singapore.

Of the remaining eight hulls, four (Auger, Marlin, Ram-Powell, and Ursa) were constructed by Belleli in Italy, two (Magnolia and Marco Polo) were constructed by Samsung in South Korea, one (Brutus) was constructed by Daewoo in South Korea, and one (Mars) was constructed by Keppel Fels in Singapore. The Belleli hulls were constructed in the 1990s, and Belleli is no longer in existence.

Most of the TLPs in deepwater worldwide are located in the GOM. However, GOM fabricators have constructed no TLP hulls. John Stiff and Joachim Singlemann in the MMS publication *Economic Impact in the U.S. of Deepwater Projects: A Survey of Five Projects* indicate that TLP hulls usually consist of four columns up to 100 feet in diameter and that the hulls have not been built by GOM fabricators because there are not many shipyards that can competitively undertake that sort of plate construction on a large scale.

Four (Brutus, Marlin, Mars, and Ram Powell) of the TLP hulls that were produced in foreign countries were transported to the GOM by Dockwise vessels. Two of these transport operations are described by Dockwise. The Marlin TLP hull was transported in 22 days in late 1998 and early 1999 by *Mighty Servant 2* from the Belleli yard in Taranto, Italy, to the Gulf Marine yard at Ingleside, where the topsides had been constructed. The Brutus TLP hull was transported in seven weeks in late 2000 and early 2001 by *Mighty Servant 3* from the Daewoo yard in Okpo, South Korea, to the Gulf Marine yard in Ingleside, where the McDermott topsides were installed.

There are five Mini-Tension Leg Platforms in the GOM: (1) Allegheny in 1999 in 1,008 meters of water; (2) Matterhorn in 2003 in 869 meters of water; (3) Typhoon in 2001 in 639 meters of water; (4) Morpeth in 1998 in 518 meters of water; and (5) Prince in 2001 in 454 meters of water. As the name indicates, Mini-TLPs are smaller versions of TLPs that were designed to reduce platform costs for small or marginal fields in benign environments such as the GOM.

The topsides and hulls of all of the GOM Mini-TLPs were constructed by GOM fabricators, with the exception of the Matterhorn hull, which was constructed by Keppel Fels in Singapore. Of the remaining four hulls, two (Allegheny and Morpeth) were constructed by Gulf Island in Houma, one (Typhoon) was constructed by McDermott in Morgan City, and one (Prince) was constructed by Amfels in Brownsville, Texas (which specializes in the construction of jackup rigs), with the tendons and piles constructed by Gulf Marine in Ingleside. Stiff and Singelmann indicate that GOM fabricators are still at an advantage over foreign competition for GOM Mini-TLPs because of the cost and danger of ocean transportation.

There are 13 spars in the deepwater GOM. Three are conventional spars, eight are truss spars, and one is a cell spar. The conventional spar has a floating cylinder hull. In the truss spar, the upper portion of the hull is the same as in the conventional spar, but the lower portion is constituted by a trussed structure similar to a conventional platform jacket. The cell spar is a mini spar in which the single large cylinder of the conventional spar is replaced by a cluster of cylindrical tubes.

All of decks/topsides of the 13 spars were constructed by GOM fabricators (including two at the McDermott's Vera Cruz, Mexico yard). All of the hulls were produced by foreign fabrication yards, with the exception of the Red Hawk cell spar, which was produced by Gulf Marine at Ingleside and installed in 2004 in 1,615 meters of water.

Of the remaining 12 hulls, nine were produced at the Mantyluoto yard in Pori, Finland, of which five were conventional spars and four were truss spars: (1) Neptune spar in 1996 in 588 meters of water; (2) Genesis spar in 1998 in 720 meters of water; (3) Gunnison truss spar in 2003 in 960 meters of water; (4) Boomvang truss spar in 2002 in 1,053 meters of water, (5) Nansen truss spar in 2002 in 1,225 meters of water; (6) Holstein truss spar in 2003 in 1,324 meters of water; (7) Hoover spar in 1999 in 1,463 meter of water; (8) Horn Mountain truss spar in 2002 in 1,647 meters of water; and (9) Mad Dog truss spar in 2003 in 2,055 meters of water. It should be noted that the truss portion of the Holstein spar was fabricated by Gulf Marine in Ingleside.

Of the remaining three hulls, two (Medusa truss spar in 2003 in 677 meters of water and Front Runner truss spar in 2004 in 1,066 meters of water) were constructed in McDermott's Jebel Ali yard in the United Arab Emirates, and one (Devils Tower truss spar in 2003 in 1,710 meters of water) was constructed at McDermott's Batam Island yard in Indonesia.

One of the major reasons for the dominance of the Mantyluoto yard in the construction of the 12 foreign-constructed spar and truss spar hulls is that McDermott had entered into a joint venture with Aker in which it was agreed that any spar contracts would have the hull built at the Mantyluoto yard and the deck built by McDermott. When this joint venture ended, McDermott was free to pursue spar hull contracts, which it did with Medusa, Front Runner, and Devils Tower. These three projects experienced cost overruns and schedule delays that placed a severe financial strain on McDermott. The Mantyluoto yard, which is now owned by Technip, continues to maintain a strong presence in the GOM spar market.

At least seven of the 12 spar hulls that were fabricated in foreign yards were transported to the GOM by Dockwise's *Mighty Servant 1*, *Blue Marlin*, and *Black Marlin*. The Nansen and Boomvay hulls were transported together from Pori, Finland, to Corpus Christi in 28 days. Gunnison was transported from Pori to Ingleside in 24 days, the hard tank for Holstein from Pori to Ingleside in 23 days, and Mad Dog from Pori to Pascagoula in 26 days. Medusa was transported from McDermott's yard in the United Arab Emirates to Pascagoula in 41 days, and Devils Tower was transported from McDermott's yard in Indonesia to Pascagoula in 50 days.

Unlike other floating production systems such as TLPs, spar topsides have to be installed offshore after the hull has been upended and installed. The complexity of these projects can be illustrated by the truss spar Gunnison, whose hull (including the tank and truss) were built at Technip's Mantyluoto yard in Pori, Finland, and whose topsides were built by Gulf Island Fabrication in Houma, Louisiana. The hull was transported by Dockwise's *Mighty Servant 1* to

Technip's Gulf Marine Fabricators yard in Ingleside, Texas and then transported to its site by Heerema tows and upended and installed by Heerema's *Balder*. The topsides from Gulf Island were then installed.

All of the existing spars worldwide are located in the GOM, and the GOM is expected to have more spars in the near future. MMS in its May 2004 *Deepwater Gulf of Mexico 2004: America's Expanding Frontier* indicates that the hull of conventional spars and the cylindrical portion of the truss spars that are located in the GOM were all constructed in foreign yards because they require large-diameter, steel-plate rolling machines. In contrast, the smaller-diameter cylinders of the cell spar can be fabricated using rolling machines that are readily available in most U.S. shipyards.

There are four semisubmersibles in the deepwater GOM: (1) Cooper in 1995 in 668 meters of water; (2) Atlantis in 2005 in 1,829 meters of water; (3) Thunder Horse in 2005 in 1,859 meters of water; and (4) Na Kika in 2003 in 1,920 meters of water.

The oldest of these is Cooper, which involved the conversion of the semisubmersible drilling rig *Glomar Biscay 1*, which was done at HAM Marine in Pascagoula, Mississippi (a deepwater port). HAM Marine became part of Friede Goldman Halter, which is now out of existence. The topsides modifications for the *Glomar Biscay 1* were conducted by HAM in conjunction with McDermott.

The Atlantis hull was constructed by Daewoo in South Korea, with topsides provided by McDermott, and is one of the largest semisubmersibles in the world. The Na Kika, whose hull and topsides were both constructed by Hyundai in South Korea, has already been described because it was one of the two GOM deepwater platforms whose topsides were constructed in foreign yards.

The Thunder Horse is the world's largest floating production unit, with a length of 156 meters, a width of 114 meters, and a total height of 132 meters. The hull was constructed by Daewoo in South Korea and carried to the GOM by Dockwise's largest ship, the *Blue Marlin*, which required modifications to be able to accommodate the Thunder Horse. The trip was conducted from late July through late September 2004 and required approximately eight weeks. The hull, with a portion of the deck and topsides already in place, arrived at Kiewit's Ingleside yard, where three modules constructed by McDermott were added.

Stiff and Singlemann indicate that conversion of semisubmersibles from drilling to production units can be accomplished at any yard capable of constructing or servicing semisubmersible drilling units. They also indicate that few GOM facilities have the size or experience to build large, deep-draft semisubmersibles. Na Kika and Thunder Horse demonstrate the feasibility of long-distance transport of massive, largely integrated semisubmersibles from foreign yards.

Notably absent from the GOM deepwater platform list are Floating Production, Storage and Offloading vessels, which have not yet been approved by MMS because of offloading-related environmental issues and hurricane-related safety issues. The GOM is the only major offshore region where FPSOs have not been deployed. Most FPSOs are converted oil tankers, maintaining their ship shape. Shipyards in the business of FPSO newbuilds or conversions have access sufficient to accommodate tankers.

Also not included on the list are subsea completions, which are common in the deepwater GOM and throughout the world. Subsea completions are typically tied into existing platforms, although sometimes placed in conjunction with new platforms.

Table 3 is derived from MMS's October 2004 *Gulf of Mexico Oil and Gas Production Forecast: 2004-2013* and provides a picture of the development of GOM subsea completions compared to the various platform types, which are displayed by production year rather than installation year as in the deepwater GOM platforms table. As can be seen from Table 3, sub sea completions became important in the early 1990s and have increased in importance over time, particularly in relation to the platforms.

Two additional projects involving platforms are described by Marshall Deluca in "The World in Depth" (*Offshore Engineer*, April 1, 2004). The Constitution truss spar in 5,000 feet of water was under development at that time, with the hull being constructed at the Technip Mantyluoto Works Oy yard in Pori, Finland, and the topsides being constructed by Gulf Island Fabrication. Under consideration for the planned Tahiti spar in 4,000 feet of water were Technip Mantyluoto for the hull and Gulf Marine for the topsides along with the Aker Kvaerner Masa yard in Finland for the hull and McDermott in Morgan City for the topsides. This suggests that Aker is reemerging as a competitor for GOM projects.

Table 3. GOM Deepwater Production Facilities

Year	Fixed Platform	Compliant Tower	TLP	Mini-TLP	Spar	Truss Spar	Semisubmersible	Total Platforms	Subsea
1979	**1**	0	0	0	0	0	0	**1**	0
1980	0	0	0	0	0	0	0		0
1981	0	0	0	0	0	0	0		0
1982	0	0	0	0	0	0	0		0
1983	0	0	0	0	0	0	0		0
1984	0	**1**	0	0	0	0	0	**1**	0
1985	0	0	0	0	0	0	0		0
1986	0	0	0	0	0	0	0		0
1987	0	0	0	0	0	0	0		0
1988	0	0	0	0	0	0	**1**	**1**	0
1989	**1**	0	**1**	0	0	0	0	**2**	0
1990	0	0	0	0	0	0	0		0
1991	**1**	0	0	0	0	0	0	**1**	0
1992	0	0	0	0	0	0	0		**1**
1993	0	0	0	0	0	0	0		**2**
1994	**1**	0	**1**	0	0	0	0	**2**	**2**
1995	0	0	0	0	0	0	**1**	**1**	**2**
1996	0	0	**1**	0	0	0	0	**1**	**3**
1997	0	0	**1**	0	**1**	0	0	**2**	**2**
1998	0	**1**	0	**1**	0	0	0	**2**	**3**
1999	**1**	0	**2**	**1**	**1**	0	0	**4**	**7**
2000	0	**1**	0	0	**1**	0	0	**2**	**6**
2001	0	0	**1**	**2**	0	**1**	0	**4**	**12**
2002	0	0	0	0	0	**2**	0	**2**	**13**
2003	0	0	0	**2**	0	**2**	**1**	**4**	**9**
2004	0	0	**2**	0	**1**	**3**	0	**6**	**8**

Source: MMS, October 2004, *Gulf of Mexico Oil and Gas Production Forecast: 2004-2013* , modified by January 31, 2005, MMS press release "Gulf Deepwater Sees Major Advance in 2004."

FABRICATION YARDS

The picture presented by the field development guides of offshore platform fabrication activity is not complete. In the case of the GOM, the jacket/base and deck/topsides fabricators for 6,000 platforms are not identified. For all fields, only primary contractors are identified, leaving out the components contributions of contractors. In addition, the basic categories obscure the fact that fabrication yards are involved in a multiplicity of activities that is much more complex than is suggested by the categories jacket/base and deck/topsides.

Mentioned in the field development guides are McDermott and its various domestic and foreign yards, Technip’s Gulf Marine Fabricators and its two yards in the Corpus Christi area, Kiewit Offshore Services and its yard in the Corpus Christi area, Gulf Island Fabrication in Houma, Omega Natchiq at POI, and Unifab at POI. All of these with the exception of Omega Natchiq are described in Oilfield Publications Limited’s *Offshore Shipbuilders and Fabrication Yards of the World*. In addition, Dynamic Industries at POI is described. These are all of the fabrication yards in the GOM that need to be taken into consideration in this analysis.

PORT OF IBERIA FABRICATION YARDS

Omega Natchiq

Omega Natchiq, Inc., at POI is part of ASRC Energy Services, which is part of the Arctic Slope Regional Corporation privately owned by the Inupiat Indians of Alaska's North Slope and headquartered in Anchorage. ASRC Energy Services, also headquartered in Anchorage, is an engineering, construction, project management, maintenance, and operations company that specializes in energy and industrial projects, with operations in Canada, Great Britain, and along the U.S. Gulf Coast.

Omega Natchiq's (formerly Omega Service Industries) webpage indicates that it is in the business of advanced technologies, ASME, electrical services, instrumentation services, offshore construction, onshore fabrication, operations and maintenance, panel manufacturing, and fire safety and that it has facilities at POI and in Belle Chase, Louisiana, that engage in the fabrication of production platforms and the complete refurbishment of existing platforms. The offshore construction portion of Omega Natchiq's services includes deck hookup, commissioning and decommissioning, ASME vessel repair, platform upgrades, production upgrades, maintenance crews, and compressor installations. The onshore fabrication portion includes deck subsystem fabrication services such as product handling systems, living quarters facilities, interconnected piping, MCC, generator buildings, compressor packages, and plant modular components.

Featured at the 62.5-acre POI facility with a 4,000-foot waterfront is a 180-foot "open cell" bulkhead system that can fabricate and load out projects in excess of 6,000 tons. Other yard features (according to the Corps' 2004 feasibility study) include a 50x250 feet fabrication shop with two 10-ton cranes, a 50x100 feet fabrication shop with two five-ton cranes, an 80x300 feet ASME coded/pipe fabrication shop with three 10-ton cranes, and a 60x150 feet climate controlled panel manufacturing and fire safety shop, as well as warehousing, tool rooms, and material preparation shops. The facility is also equipped with three 150-ton, two 230-ton, and one 300-ton crawler cranes and ten 15-ton cherry pickers.
An excellent overview of the competitive position and business strategies of Omega Natchiq is presented by Marshall De Luca in the February 9, 2005, *Offshore Engineer*:

> The yard, like all in the Port, is limited by draft restrictions in the access channel that cannot accommodate the large deepwater structures. As such, Omega has carved its niche in building module and supporting structures for offshore facilities. To date, the company has fabricated components for several major projects in recent years including the topsides for El Paso's Prince mini-TLP, the first ever constructed at the Port of Iberia, the production deck for Pioneer's Falcon Nest platform, pieces for BP's Mardi Gras deepwater pipeline and the rig module for Chevron Texaco's Benguela-Belize compliant tower-based development off Angola.
>
> At full force Omega employs between 450 and 500 workers, but at the moment is around 25% of that capacity.

‘For us, 2003 and early 2004 were a busy year,’ says Omega president and CEO Joey Zagar. ‘We were at peak manpower in the first quarter of 2004, but we haven’t secured many large contracts since, just a lot of smaller contracts.’

Zagar says as the backlog has dwindled, the recent trend in the market has been for smaller, miscellaneous jobs such as caisson structures and refurbishment work. And because of the company’s smaller size, it is well-suited to survive on this activity.

‘We are not considered a large fabricator. We compete against the large yards like McDermott and Gulf Island, but for us we will take a $10,000 job as well as a $10 million,’ he adds.

Adding another layer of insulation is Omega’s diversification which offers what Zagar calls, for lack of a better term, a ‘one-stop shop’. Besides fabrication capabilities, the company also has a technical group that performs electrical and instrumentation panel manufacturing, automation and control and fire and safety. In addition the company has an operations and maintenance group that can take a platform from the construction yard to the install site and perform hookup, commissioning and, if called upon, operation.

‘This group is one of those that we have seen some growth in our business, not only in the upstream side but also in the midstream,’ he says. ‘The key for us in surviving is looking at other areas, diversifying our company and being a little bit more flexible in where we are going to go and where we are going to do work and not relying on the old oil and gas business as we know it and being a little bit more global and diversified as a company.’
Another driver for this diversification beyond the dwindling number of jobs, is the competition in the market.

‘If you look at the number of competitors we have for all the services we provide it is mind-boggling,’ Zagar says. ‘It is unbelievable the number of people that are competing against us, all the way from Mom and Pop operations to substantial well-established type business units. It is not uncommon for us to see as many as 12 to 15 people bidding on a relatively small job. That is pretty tough when everyone needs work.’

As to the future, while the company is chasing the deepwater Gulf of Mexico jobs, it is also turning its attention to more international work, which helped provide much of the yard’s recent activity, specifically the Benguela Belize project for West Africa. One region in particular the company is targeting is the Mexican market where it has seen an increasing amount of bids recently. The company is presently in talks with some local Mexican fabricators about handling overflow work.

The US, however, will continue to remain flat, unless something can be done to reshape the market. In terms of the deepwater structures, Zagar says the preference at the moment is for production equipment to be built in the US while the large hulls are built in the international yards. With the expertise and quality of work in the US, this, he says, needs to change, possibly by teaming up to tackle the competition together.

'We have some very capable and very good size shipyards that we need to capitalize on and team up to get involved in building the whole units and trying to change the direction. They are tough to compete with but we can compete. We are very successful in one part of the business. We just need to look and analyze and work with the right people that might be able to get a leg up on them.'

And all it will take is one job to turn things around, he adds: 'There are a lot of us that need work so the market is getting more competitive. One project of that nature keeps several fabrication yards busy.'

Dynamic Industries

Dynamic Industries, Inc., provides large and small scale onshore fabrication, offshore hookups and maintenance crews, plant installation and modifications, industrial maintenance, pipeline fabrication, salvaged jacket and deck storage, contract services, and MMS compliance assurance.

A large yard (55 acres) and a small yard (16 acres) are maintained at POI, along with an eight-acre facility in Harvey, Louisiana, that deals with small-scale, quick turnaround projects. The main yard has two slips capable of loading out structures up to 6,500 tons. The facility includes many improvements, such as three feet of stabilized limestone and underground facilities and a new 152x400 feet fabrication shop with a 70-foot hook height. The building is designed with two large construction bays, each equipped with four 20-ton gantry cranes. Also installed is the latest in computer guided plasma-arc/gas cutting systems and submerged-arc automated welding systems.

The yard directory indicates a total workforce of 900 and a permanent production force of 773 (although these numbers have undoubtedly changed). Topsides projects from 1996 forward listed in the directory include:

1. VASTAR, 4-pile drilling deck, 100t, 1998.
2. Mobil Equatorial Guinea, production modules, 1998.
3. BP Exploration, 57.95m flare boom for Northstar Project (on hold), 1998.
4. UPRC, refurbish production deck, 1999.
5. Shell Deepwater, process modules, 1999.
6. IP Petroleum, caisson platform, 1999.
7. Walter Oil & Gas, refurbish platform, 1999.
8. IP Petroleum, refurbish platform, 1999.
9. Nippon Oil, refurbish platform, 1999.
10. Spinnaker Exploration, refurbish platform, 1999.

11. Coastal Oil & Gas, refurbish deck, 1999.
12. Westport Oil & Gas, new 85.4m water depth jacket, 2000.
13. Newfield Exploration, refurbish water depth upgrade.
14. PetroQuest, fabrication of structure.
15. Pogo Producing, fabrication of 1900t deck with helideck.
16. Chiefton International, fabrication of 400t deck and jacket.
17. Shell Oil, fabrication, installation and pre-commissioning of two 1,500 HP compressors.
18. El Paso, refurbish 4-pile deck/jacket and addition of new production facilities.
19. Wetport Oil & Gas, fabrication of 3-pile deck and appurtenances.
20. Stone Energy, fabrication of 900t deck with facilities and jacket.
21. Pogo Producing, fabrication of 1900t deck, helideck, with facilities.
22. Hanover, fabrication of two 100t production modules.
23. Hanover, refurbish two compressors.
24. Chevron, fabrication of 400t deck, helideck, with facilities.
25. Babcock Borsig, fabrication of duck work for power plant.
26. Pogo Producing, fabrication jacket, 1600t deck with facilities.

Unifab

Unifab International, Inc.'s primary line of business is the fabrication and assembly of jackets, decks, topside facilities, and quarters buildings for installation and use offshore in the production, processing, and storage of oil and gas. The facility for engaging in this work is located on 150 acres at POI and includes a 225,000 square foot fabrication facility, computerized pipe and plate cutters and a four-inch rolling mill, and 8,000 feet of water frontage, of which 3,000 feet is steel bulkhead that permits outloading of heavy structures.

According to the company's 2003 SEC filing, UNIFAB's customers are primarily major and independent oil and gas companies and offshore marine construction contractors. Fixed platforms and other structures fabricated by the company are used primarily in the GOM and offshore West Africa. Price and the ability to meet delivery schedules are the primary factors in determining which fabricator is awarded a contract. Also considered are the availability of technically capable personnel and facility space, efficiency, condition of equipment, reputation, safety record, and customer relations.

The ship, bulkhead, and loadout facilities at the fabrication yard enable the company to produce decks and deck components weighting up to 6,500 tons, but access channel limitations restrict structure weights to something under 4,000 tons. A site was acquired in Lake Charles in 1999 on the 40-foot deep Calcasieu Channel, with operations begun in 2000. The purpose of this acquisition was to secure a deepwater location for the assembly of larger platform components from the POI facility and also to enter into a new line of business: maintenance, refurbishment, and upgrade of deepwater semisubmersible drilling rigs and jackup rigs.

The Lake Charles facility experienced difficulties related to its labor force and business volume, completed its last contract in 2004, and has now been sold. A process systems facility at POI has also been discontinued and will be sold. The financial decline of this publicly traded company, which has now become private under the name Midland Fabrication, is illustrated in Table 4. The company lost $6.2 million in the nine months ending September 30, 2004, including $3.5 million at the Lake Charles facility (of which $3.3 million was an impairment loss) and $1.3 million at the process facility in POI. If the company is unsuccessful in returning to profitability or obtaining needed capital, it will not be able to remain a going concern.

Table 4. UNIFAB's Financial Development

	Year Ended December 31					Year Ended March 31					
	2004	**2003**	**2002**	**2001**	**2000**	**2000**	**1999**	**1998**	**1997**	**1996**	**1995**
Sales (million $)	NA	55.8	33.3	81.7	77.7	73.1	103.9	109.2	92.3	65.7	62.7
Income (million $)	NA	(11.8)	(20.5)	(29.3)	(9.1)	(2.1)	6.3	7.2	4.3	4.6	2.6
Assets (million $)	NA	40.3	39.3	63.2	82.7	84.7	70.0	59.7	42.8	35.4	23.9
Hours (thousand)	NA	839	479	1,176	1,166	1,040	1,324	1,409	1,177	877	688
Employees	NA	425	317	450	674	600	416	685	510	420	290
Backlog (million $)	NA	7.6	22.5	8.3	27.0	19.2	27.1	50.3	44.9	51.1	36.3

Source: SEC filings.

Note: At the time of this report Dynamic Industries at POI is in the process of purchasing Mid-Fab, which was a successor to Unifab. The acquisition will allow Dynamic to eliminate a competitor for deepwater projects, but does not reduce the number of fabrication yards or yard capacity at POI.

FABRICATION YARDS OF MAJOR COMPETITORS

Gulf Island

Gulf Island Fabrication, Inc., was founded in 1985 and is located in Houma, Louisiana, on the Houma Navigation Canal. The Houma Navigation Canal has an *authorized* depth of 15 feet. The New Orleans District Operations Division maintains the channel. Maintenance is performed by contracting private dredging companies to dredge to a depth of 15 feet plus 3 feet of advanced maintenance. The practice for private dredgers is to dredge an additional one-foot to ensure meeting contract requirements. Thus the Houma Navigation Canal is 19 feet deep. The users of this channel count on this practice on a regular basis.

Gulf Island and its subsidiaries specialize in the fabrication of offshore drilling and production platforms and specialized structures used in the development and production of offshore oil and gas reserves. Structures and equipment fabricated include jackets and deck sections of fixed production platforms; hull and/or deck sections of floating production platforms (such as TLPs), Spars, and FPSOs; piles, wellhead protectors, subsea templates and various production, compressor, and utility modules; and offshore living quarters.

The main fabrication yard is located on the east bank of the Houma Navigation Canal and encompasses 140 acres, of which 100 acres are developed for fabrication. Facilities include a

25,000 square foot administrative building, 267,000 square feet of covered fabrication area, 17,000 square feet of warehouse storage area, and 8,000 square feet of training and medical facilities. The yard has 2,800 feet of water frontage, of which 1,500 feet is steel bulkhead. A west yard across the canal encompasses 437 acres, of which 130 are developed for fabrication, and includes 72,000 square feet of covered fabrication area, 4,600 feet of warehouse storage area, and 6,750 feet of water frontage, of which 2,350 feet is steel bulkhead.

Gulf Island's SEC filing for year 2004 indicates that its primary customers are major and independent oil and gas exploration and production companies. Sales of structures used in the GOM during the last five years accounted for 81 percent of company revenues, with the remainder accounted for by structures installed in offshore Canada, West Africa, Latin America, and the Caribbean. Major competitors for the fabrication of platform jackets to be installed in the GOM in water depths greater than 300 feet are Technip, McDermott, and Kiewit. In addition to these three, Gulf Island competes with six other fabricators for platform jackets in intermediate water depths (150-300 feet). The company believes that price and ability to deliver on time are the major factors in contractor selection, followed by availability of personnel, facility space, efficiency, equipment condition, reputation, safety record, and customer relations.

Gulf Island has a major proprietary interest in the MinDOC (Minimum Deepwater Operating Concept) drilling and production system, which is designed for use in water depths of 1,000 to 10,000 feet. Featured GOM deepwater projects on Gulf Island's webpage include Texaco-Marathon's Petronius, British Borneo's Morpeth, British Borneo's Allegheny, and Conoco's Jolliet. In 2004, Gulf Island began fabrication of the 5,900-ton topsides for the Kerr-McGee Constitution Spar (which will be installed in 5,000 feet of water in the GOM), completed a 7,000-ton topsides (which will be installed on a Spar in 3,330 feet of water in the GOM), and completed an 8,700-ton 690-foot jacket that will be installed in the GOM.

Gulf Island's annual report for 2004 indicates that it has achieved 17 consecutive years of profitable operations, is debt free, and has a healthy backlog of project revenue for 2005, of which GOM deepwater projects account for one-fourth and foreign projects account for one-half. Table 5 indicates that Gulf Island has been able to maintain a high level of stability and profitability in the volatile offshore platform fabrication industry.

Table 5. Gulf Island's Financial Development

	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
Sales (million $)	173.9	203.7	142.9	113.7	112.1	120.2	192.4	136.4	79.0	63.8
Income (million $)	12.0	15.8	5.6	7.3	4.2	6.7	18.8	12.4	7.3	1.6
Assets (million $)	152.3	140.3	113.1	102.5	96.1	95.0	97.7	67.7	35.9	30.4
Hours (thousand)	2,075	2,337	1,856	1,659	1,652	1,851	2,615	2,150	1,073	920
Employees	1,050	NA	NA	NA	NA	NA	NA	NA	NA	NA
Backlog (million $)	88.2	99.2	92.5	54.4	26.6	38.9	67.3	86.3	87.0	22.0

Source: SEC filings; 2004 employment from Hoover's Online.

Gulf Marine

Gulf Marine Fabricators in the Corpus Christi area is part of the Paris-headquartered international firm Technip, which designs and builds drilling platforms, gas processing plants, refineries, and petrochemical plants. Technip had 19,000 employees and $7 billion in sales in 2004. The facilities in the Corpus Christi area were established in 1991 and originally owned by Aker's Deepwater Division, which was acquired by Coflezip in 2001, which joined with Technip in 2001 to form Technip-Coflezip, which now operates under the name Technip.

Gulf Marine has two yards in the Corpus Christi area that are physically located near each other and that complement each other operationally. The North Yard at Ingleside is a 160-acre component and small structures fabrication facility located on the Intracoastal Waterway three miles from the Corpus Christi Ship Channel. The North Yard has 3,000 feet of water frontage and a 1,000-foot bulkhead, with depth at the bulkhead ranging from 16 to 30 feet, as well as a deck fabrication building, a blast and paint building, pipe mills, brace rack, and pile rack.

The South Yard at Aransas Pass encompasses 200 acres, is located at the intersection of the Corpus Christi Ship Channel and the Intracoastal Waterway, and is referred to as "The Deepwater Facility" because of its immediate access to the 45-foot deep Corpus Christi Ship Channel. The yard includes 2,600 feet of bulkhead with a 670 by 225 feet hole that is 78 feet deep hole that is used to offload vessels, structures, and rigs from semisubmersible oceangoing vessels or barges. The yard features a 4,400-ton capacity 210-foot radius Specialized Lifting Device with two 410-foot beams that has performed numerous module/rig package lifts in excess of 3,000 tons related to floating drilling platforms, production platforms, and drillships.

The fabrication yard directory indicates a total workforce of 1,217 and a permanent production force of 917 for the two yards and lists 46 projects completed or underway since 1996. Gulf Marine Fabricator's brochure features the following projects:

- Fabrication and outfitting of the 23,000-ton three-deck topsides for PEMEX's Cantarell Field Development in Mexico, representing one of the largest single-piece topsides built for the GOM.

- Fabrication of the 8,800-ton topsides for Exxon/Mobil Jade in Equatorial Guinea, including outfitting, testing, and mechanical completion.

- Fabrication, integration, and precommissioning of two 4,000-ton topsides and fabrication of appurtenances, tendons, tendon porches, piles, and buoyancy modules for BP/Amoco's Marlin TLP in 3,240 feet of water in the GOM, which was the world's first project built under an EPCI (Engineer, Procure, Construct, Install) contract.

- Fabrication of the 5,000-ton topsides and the 25,000-ton jacket for the Elf Virgo located in 1,130 feet of water in the GOM, which is the fourth largest fixed platform in the world. The jacket is 310 feet square at the base and 1,150 feet in length.

- Fabrication of the 2,930-ton 342-foot jacket for the Anadarko Tanzanite project, which is located in 315 feet of water, along with the eight 84-inch O D skirt piles that have a total weight of 2,140 tons.

- Receiving and mating the two spar hull sections for the Chevron Genesis project, along with hull rotations, miscellaneous appurtenance work, and hull systems completion.

- Fabrication, outfitting, and testing and delivery of the derrick, substructure, and related equipment for the world's two largest drillships, measuring 125 feet by 835 feet with a displacement of 100,000 metric tons. The derricks and substructures were constructed at the North Yard, skidded onto a barge, and transported to the South Yard, where the Specialized Lifting Device installed the derrick and substructure as a single 4,400 ton module onto each ship for integration and outfitting.

According to the fabrication yard directory, Technip's Mantyluoto Oy yard in Pori, Finland, has a workforce of 666 and a production force of 440. There are 7,218 feet of jetties and wharfage, including an 820-foot outfitting quay and a 985-foot repair quay. For its Spar projects, the yard uses an RMS system with a lifting capacity of 2,400 tons, a multipurpose pontoon capable of handling 11,000 tons, and a skidding system capable of handling 12,000 tons. The facility is located on a 26-foot channel.

Note: At the time of this report Gulf Island Fabrication, Inc. has executed an agreement with Technip-Coflexip USA Holding, Inc. for purchase of all facilities, machinery and equipment of Technip-subsidiary, Gulf Marine Fabricators, located near Corpus Christi, Texas. As with Dynamic's acquisition of Mid-fab at POI, this reduces the number of the larger (non-POI) firms in competition for deepwater projects, but does not reduce the yard capacity among the remaining larger fabricators.

<u>Kiewit</u>

The Kiewit yard in Ingleside, Texas, is part of Kiewit Offshore, which is part of Peter Kiewit Sons'. Peter Kiewit Sons' is a 14,000 employee firm headquartered in Omaha, Nebraska, which was founded in 1884 and is one of the largest construction and mining companies in North America. Kiewit Offshore Services is a steel fabricator for the offshore oil and gas industry that was founded in January 2001 to pursue the offshore fabrication market. Although Kiewit was operating as a fabricator in the GOM since the early 1980s based on joint ventures (such as the Bullwinkle platform), construction of the Ingleside yard did not begin until February 2001.

The Ingleside facility encompasses 400 acres on the 45-foot deep LaQuinta Channel in the Corpus Christi area. The facility features a 13,000-ton capacity 225-foot radius Heavy Lift Device with twin independent 500-feet A-frame booms/400-foot masts and a 450-foot hook height. There is a 45-foot depth at the bulkhead and a 78-foot deep hole for offloading, as well as high-pressure gas, high-voltage electricity, and fiber optics services at the bulkhead. The facility is designed and equipped to handle TLPs, semisubmersibles, and FPSOs, as well as conventional fixed platforms.

Kiewit also has two yards in Canada. Offshore projects conducted by Kiewit's Canadian yards or as joint ventures in the GOM prior to the acquisition of the Ingleside facility include:

- Mobil's Green Canyon jacket, 1985;
- Shell's Bullwinkle jacket, the world's largest fixed platform, 1988;
- TotalFina-Elf's Virgo jacket and deck, the world's fourth largest fixed platform, 1990;
- BP's Amberjack jacket, the world's sixth largest fixed platform, 1991; and
- Hibernia, the world's largest gravity-base structure, installed off the coast of St. John's, Newfoundland, 1997.

Projects conducted out of the new Ingleside facility include:

- Equipment installation on the Na Kika Hull for Shell, 2002;
- Production of the bridge footings for the San Francisco/Oakland Bay Bridge, 2002-2003;
- Installation of two topside modules, workshop, and living quarters on the Magnolia TLP hull for ConocoPhillips, 2004; and
- Fabrication of the Tarantula topsides and jacket for Anadarko, 2003-2004.

Kiewit's webpage indicates that it is currently involved in three projects and has a solid backlog of work in 2005.

McDermott

McDermott International, Inc., is incorporated under the laws of the Republic of Panama and is an energy services company that provides engineering, procurement, and project management for companies involved in the production of energy. McDermott International grew out of J. Ray McDermott, which was formed in 1923 to supply wooden drilling rigs to the oilfields of East Texas, built and installed the earliest platforms to support offshore drilling and production in the GOM after World War II, and was operating worldwide by the 1970s. The name was changed to McDermott International in 1983 to reflect acquisitions and the geographic scope of operations, and the name J. Ray McDermott was assigned in 1995 to cover the company's marine construction operations.

McDermott International has about 12,500 employees worldwide and is divided into three operating divisions. The Government Operations division (through BWXT Technologies) supplies nuclear components and various services to the U.S. Government, including uranium processing, environmental and site restoration services, and management and operating services. The Power Generation Systems division (through Babcok & Wilcox) supplies fossil-fueled steam generation systems and associated equipment, replacement nuclear steam generators, and environmental equipment and systems for the reduction of emissions from power plants. The

Marine Construction Services division (through J. Ray McDermott) designs, engineers, fabricates, and installs offshore drilling and production facilities and installs marine pipelines and subsea production systems, as well as offering comprehensive project management and procurement services.

J. Ray McDermott operates in most of the major offshore oil and gas producing regions worldwide, including the GOM, Mexico, South America, the Middle East, India, the Caspian Sea, and Asia Pacific. McDermott's main yard is in Morgan City. However, it also operates yards in the Corpus Christi area (Harbor Island); in Veracruz, Mexico (Talleres Navales del Golfo, generally referred to as TNG); in Dubai, United Arab Emirates (Jebel Ali); and Batam Island, Indonesia (Batam Island).

J. Ray McDermott's fabrication facilities are equipped with a wide variety of heavy duty construction and fabrication equipment, including cranes, welding equipment, machine tools, and robotic and other automated equipment. JRM fabricates a full range of fabrication structures from conventional fixed platforms to intermediate water and deepwater platform configurations employing Spar, compliant tower, and tension leg technologies, as well as FPSO technologies.

JRM's overseas yards are a reflection of its longstanding propensity to establish fabrication capacities in primary markets. The yards do not compete with the yard in Morgan City. Some of the hulls for deepwater projects in the GOM were constructed by these yards because of equipment capacity and channel depth. These yards do, of course, compete with the Morgan City yard for company investments.

The Batam Island yard is southeast of Singapore and is composed of north and south components with 40-foot access depth. The fabrication yard directory indicates a total workforce of 5,300 at peak and a permanent production force of 3,860 at peak. Loadout capacity is 25,000 tons in the north yard and 12,000 tons in the south yard. Projects range from conventional platforms to FPSOs and are primarily for the regional market (Indonesia, Malaysia, Thailand, etc.).

The Jebel Ali yard has an access depth of 38 feet and can handle loadouts of up to 25,400 tons. The total workforce is 3,734, and the permanent production force is 2,777. Most of the projects are conventional platforms in Qatar and India.

The TNG yard in Veracruz is largely a ship building and repair facility that occasionally is involved in fabrication activities either alone or in conjunction with the Morgan City yard. The access depth is 42 feet. The total workforce is 815, and the permanent production force is 220. Services include new building of ships of Panamax size; ship repair; construction and repair of offshore structures and maritime facilities; maintenance of semisubmersibles and jackup rigs; and conversions, upgrades, and life extensions of seagoing vessels and offshore units.

The Harbor Island yard is located near Aransas Pass and has a 45-foot deep access channel. The fabrication yard directory indicates a total workforce of 700. Prefabricated components are sent from Morgan City by way of the GIWW to the Harbor Island yard, where they are assembled. There are four launchway skids, and the site easily accommodates towout of very large structures, the largest of which has been 32,652 tons. This yard is presently inactive because of a lack of business.

The Morgan City yard is located on a 20-foot access channel, and, at the time the fabrication yard directory was prepared, had a total workforce of 1,050. According to the 2003 draft *Atchafalaya River and Bayous Chene, Boeuf, and Black Project and Proposed Atchafalaya River Deepening Study*, the yard produces platform jackets, deck sections, deck facilities, production modules, drilling modules, and quarters modules; oil and gas processing, transfer, and storage facilities; floating platforms and production facilities; offshore floating terminals; subsea production facilities; control systems for subsea production wells; process piping; process vessels; and caissons and engages in rig repair.

The Morgan City yard has a total area of 589 acres and a developed area of 287 acres. There are 31 acres of outside storage and 167,000 square feet of covered storage. Process modules, deck sections, and other subassemblies are fabricated in the yard's two deck assembly buildings, both of which are 400x800x100 feet and located adjacent to a 2,500-foot barge slip. Jackets and topsides are assembled in the erection area adjacent to the yard's 13,000-foot bulkhead. These large areas can simultaneously accommodate numerous projects of different types and sizes. For example, the southeast yard accommodated three deepwater structures of 1,000 feet, 750 feet, and 680 feet concurrently. The largest jacket and topsides fabricated by the Morgan City yard weighed 26,000 tons and 23,000 tons, respectively.

J. Ray McDermott is well known as having produced more offshore platforms than any other firm in the world. Many of the projects produced at the Morgan City yard and in other yards have been identified in the previous chapter. Because of the diverse nature of the Marine Construction Services division, McDermott's year 2004 SEC filing lists a wide range of competitors: Allseas Marine Contractors, Daewoo, Global Industries, NPCC (Abu Dhabi), Heerema Group, Hyundai, Kiewit, Nippon Steel, Saipem, Stolt Offshore, and Technip. Price is normally the most important factor in contractor selection, although availability and technical capabilities of equipment and personnel, efficiency, condition of equipment, safety record, and reputation are also taken into consideration.

The Marine Construction Services division achieved revenues of $1.1 billion in 2002 and $1.8 billion in 2003, but sustained losses of $486 million in 2002 and $45 million in 2003. These losses were primarily the result of schedule delays and cost overruns in three Spar projects at the Morgan City yard (Medusa, Devils Tower, and Front Runner), the Carina Aries project off the coast of Argentina, and the Belanak FPSO project on Batam Island. The financial position of McDermott International was worsened by asbestos litigation inherited through the acquisition of Babcock & Wilcox, which forms the core of the Power Generation Systems division.

J. Ray McDermott sustained a financial turnaround in 2004, achieving revenues of $1.4 billion and operating income of $84 million as a result of improved operations, completion of four projects under the originally projected losses, and the sale of nonstrategic assets. A backlog of $1.2 billion at the end of 2004 is expected to generate $900 million in revenues in 2005 and $300 million in 2006 for the Marine Construction Services division.

Because this division is engaged in a diversity of services and includes a number of fabrication yards, it is impossible to gain a clear picture of the Morgan City yard on the basis of public documents. In "Building Off the Boom" (*Offshore Engineer*, February 9, 2005), Marshall De Luca reports with respect to the Morgan City yard that "for the near-term, projects are expected to be scarce and competition tight, at least in the deepwater fabrication market, which has become its forte."

<u>Other US</u>

There are many firms in the U.S. other than the five described above that are involved in various aspects of offshore production platform fabrication, and all of these are located in the GOM.

The January 1, 2000, issue of *Offshore* magazine provides an article by Mike Hunt and Lenny Gary ("Gulf of Mexico Fabrication Yards Build 5,500 Platforms Over 50 Years") along with a poster foldout that describes the results of a 1999 survey of GOM fabricators that produced a list of 51 fabrication yards (some of which are multiple yards under a single owner). The survey found that out of the 51 yards, 23 fabricate jackets, 15 fabricate decks, 29 fabricate modules, 22 fabricate living quarters, and 20 fabricate control buildings. However, only nine reported a single-piece fabrication capacity of more than 10,000 short tons, and 12 indicated a capacity to fabricate structures intended for water depths exceeding 10,000 feet.

The poster list includes most of the fabricators that have previously been discussed (the exception is Kiewit), but it also includes others that have disappeared, are under new ownership, or are concentrating on a different line of business. The following description of other fabrication yards in the GOM will rely on more recent sources. It should be recognized that such listings can never be final because of rapid changes in the industry and that they can never be exhaustive because they necessarily involve arbitrary cutoff points concerning inclusion and exclusion.

There are seven fabricators listed on POI's webpage other than Dynamic, Omega, and Unifab. None of these are listed in the *Offshore Shipbuilders and Fabrication Yards of the World*. The POI-listed fabricators are:

1. Coastal Fabrication – Part of the Energy and Chemicals segment of Chart Process Systems. Produces cold boxes (cryogenic processing systems for liquefying natural gas) for the international market. Cold boxes weigh in the vicinity of 500 metric tons. Transportation is normally by barge.

2. Greg Guidry Enterprises – Is located on the property of and provides welding services to The Bayou Companies, which is also listed on POI's webpage as in the business of pipe coating, welding, bonding, custom coating, and concrete coating.

3. J.I.G. Machine Works – A new registrant in Louisiana and new occupant of POI engaged in manufacturing and fabrication. No other information available.

4. Loadmaster Derrick & Equipment – Provides worldwide derrick, mast, substructure, and accessory design and fabrication (1,000-ton capacity) and derrick/mast upgrades. Main facility is in Broussard, Louisiana. New Iberia facility provides fabrication and port capacity.

5. Natco Manufacturing – Part of the Natco Group, which is a publicly traded multinational corporation that supplies process equipment to the oil and gas industry. New Iberia facility provides fabrication from single large pressure vessels and skids to complete offshore production systems.

6. Regional Fabricators – Provides general services, including the design, fabrication, and coating of almost all metal structures. Features design and fabrication of drilling rigs, ships/boat repair, and design, fabrication and installation of ocean bottom cable handling equipment.

7. Superior Derrick Services – Designs and fabricates drilling rigs and structures and provides general services with respect to the design and fabrication of drilling rig accessories and components. New Iberia facility designs and fabricates land, barge, and platform drilling rigs, as well as prefabricated drilling packages and structures, including masts, towers, heliports, production packages, and living quarters. Features 6,000-ton loadout capacity. Additional facility in St. Martinville, Louisiana.

The shipyard/fabrication yard directory lists 90 yards in the U.S., many of which are involved in shipbuilding activities unrelated to the offshore platform construction industry. All of the U.S. yards that are involved in the platform construction industry are located in the GOM. Listed in the directory (other than those that are given special consideration in this study) are 13 yards that are involved in various aspects of offshore platform fabrication:

1. AMFELS – Wholly owned subsidiary of Far East Levingston Shipbuilding of Singapore. Located at Port of Brownsville. Provides refurbishment, repair, conversion, and new building of barges, mobile offshore drilling units, pressure vessels, and processing units.

2. Bay Ltd – Located off the GIWW at Morgan City. Provides structural, piping, skid/module assembly, deck outfitting, and quarters fabrication and FPSO and drilling rig conversions. Additional facilities in Corpus Christi and New Orleans.

3. Bollinger – Primarily ship repair and conversion, with 13 facilities in Louisiana and Texas. The facility in Fourchon, Louisiana, provides jackup drilling rig repairs and conversions.

4. Chet Morrison Contractors – Located on Houma Navigation Canal. Constructs decks, skids, platforms, and buildings. Additional facility in Harvey, Louisiana, that produces piping and modular components for the Houma yard.

5. First Wave Marine – Primarily shipbuilding and repair, with facilities at Pelican Island, Brady Island, Galveston Island, and Pasadena in Texas. The Pelican Island facility is located on the Galveston Ship Channel and repairs, converts, modifies, and upgrades semisubmersibles, jackups, submersibles, drillships, and FPSOs.

6. Global Industries – Headquartered in Carlyss, Louisiana, on the Calcasieu Ship Channel. Provides offshore construction, engineering, and support services worldwide, including pipeline construction, platform installation and removal, and diving services. Facilities worldwide. Facility in New Iberia provides diving services.

7. Gulf Copper & Manufacturing – Located in Port Arthur, Texas, on the Taylor Bayou Turning Basin. Activities include FPSO conversions and drillship and rig modifications.

8. Kellogg Brown & Root – Located on Greens Bayou with access to the GOM through the Houston Ship Channel. Presently inactive. Traditionally involved in the fabrication of drilling and production platforms, process skids and modules, subsea components, FPSO components, and semi-drilling rig components.

9. LeTourneau – Located in Vicksburg with access to the GOM through the Mississippi. Constructs jackup drilling rigs.

10. Offshore Specialty Fabricators – Located on the Houma Navigation Canal. Fabricates offshore production platforms, refurbishes jackup rigs, and installs and dismantles platforms. Additional facility in Ingleside, Texas, designs and fabricates process equipment skids.

11. Signal International – Six facilities with deepwater access in Orange and Port Arthur, Texas, and in Pascagoula, Mississippi. Previously owned by Friede Goldman Halter. Provides modifications, repairs, and drydocking for semisubmersibles, jackup drilling rigs, drillships, FPSOs, and FPSs.

12. Superior Fabricators – Located in Baldwin, Louisiana (below New Iberia) on the Charenton Navigation Canal. Founded in 1962, employs 150, and has a 70,000 square foot shop on 16 acres three miles from the GIWW. Fabricates decks, jackets, helidecks, and jackup legs.

13. Twin Brothers Marine – Located on the GIWW at the Port of West St. Mary near Lafayette, Louisiana. Founded in 1975. Total workforce of 400 and permanent production force of 223. Fabricates offshore oil and gas decks and other steel modules to 10,000 tons and jackets to 800 feet of water depth. Has completed projects in GOM, Trinidad, West Indies, Venezuela, Nigeria, Cote D'Ivoire, Cameroon, and Gabon.

Fabricators listed in the *Offshore* poster other than those in the shipyard/fabrication yard directory include:

1. Delta Engineering Corporation – Located in Channelview, Texas, near the Houston Ship Channel, but with 12 feet of water depth in the Carpenter's Bayou Barge Canal. Fabricates topsides/decks up to 6,000 tons and large and small production modules, including compressor modules, power generation modules, FPSO modules, and oil procession skids for the GOM and international markets. In the fabrication business since 1985.

2. Gulf Coast Marine Fabricators – Located at the Port of Vermilion on the Vermilion River near Abbeville, with access to the GOM through the Vermilion River and the GIWW. Fabricates heliports, decks, and living quarters.

3. Houma Industries – Located on the Harvey Canal in Harvey, Louisiana, across the river from New Orleans. Fabricates oil and gas processing packages ranging from several hundred pounds to 2,000 tons. Additional facility established in Nigeria in 2000.

4. Max Welders – Located in Gibson, Louisiana, with access to the GOM by way of Bayou Black and the GIWW. Fabricates small jackets and decks and skid mounted production equipment, primarily for the GOM.

5. Shaw – Located in Delcambre, Louisiana, with access to the GIWW. Fabricates production equipment, modules, decks, and jackets.

6. State Service – Located on the GIWW near the Corpus Christi Ship Channel. Fabricates products ranging from modular decks to large production platforms.

Foreign Yards

Among the foreign fabricators that participated in deepwater GOM projects (largely through hull construction) were the South Korean firms Daewoo, Hyundai, and Samsung; Keppel Fels in Singapore; Belleli in Italy (now defunct); and McDermott's foreign yards. Although these are some of the largest players in the offshore platform fabrication industry (including shallow water conventional platforms and floaters), they represent only a small percentage of the firms involved in that industry.

All of the foreign yards that were involved in deepwater GOM projects are owned by international competitors and can be characterized as having large workforces, oriented on shipbuilding as well as platform fabrication, and with deepwater access. Hyundai can be used as an example. Among its six divisions, Hyundai has a shipbuilding division and an offshore division. The shipbuilding division produces such things as tankers, carriers, FPSOs, submarines, and destroyers; and the offshore division produces such things as FPSOs, semisubmersibles, TLPs, fixed platforms, and jackups. Most of the work of the offshore division is done at the Ulsan yard on Mipo Bay, which has a total workforce of 10,930 and a technical/engineering force of 8,600 and features a 60,000-ton loadout capacity. The lift of the 12,000-ton topsides for the Na Kika at this yard was entered into the Guinness Book of World Records. Most of the work of the shipbuilding division is done at the Chollanam-do yard three miles distant at the port, which has a workforce of 6,926 and a permanent production force of 2,121 and produced 64 ships in 2004.

It is obviously impossible within the context of this report to characterize all of the foreign competitors to U.S. platform fabricators; and in any case, this changes from country to country, with U.S. fabricators limited in the capacity to participate in the projects of many countries because of geographic distance or prohibited from participating in the projects of many countries that mandate local fabricator participation.

The degree of competition in a market (West Africa) that is important to U.S. fabricators can be illustrated by Angola. Of the 128 shallow water conventional platforms offshore Angola, U.S. GOM fabricators provided the jackets and decks/topsides on 25 projects, the jacket on one, and the deck/topsides on two. Foreign fabricators participated in 86 shallow water projects (as well as providing almost all of the FPSOs and semisubmersibles for the shallow and deepwater projects), including French, Nigerian, Angolan, Portuguese, South African, South Korean, and Brazilian yards.

The major participant was the French firm Bouygues Offshore (now part of the Milan-based Saipem), which provided the jackets and decks/topsides on 36 projects, the jackets on five, and the decks/topsides on four. Most of the Bouygues projects were conducted as joint ventures with the state oil company Sonangol under the name Petromar out of a yard in Ambriz, Angola. Still others were produced in Bouygues' Congo yard. Other important participants were Daewoo, which provided the jackets and decks/topsides on six projects and the decks/topsides on three; Hyundai, which provided the jackets and decks/topsides on six projects; and the Scotland-based UIE in Warri, Nigeria, which provided the jackets and decks/topsides on six projects. Three Brazilian yards were responsible for six jackets and decks/topsides and three decks/topsides.

Of the 128 shallow water platforms in offshore Angola, Angolan yards were responsible for 51 jackets and 46 decks/topsides. Most of these were produced in Bouygues' Ambriz yard, which is no longer in existence. Four jackets and three decks/topsides were produced in the Paris-based Stolt Offshore S.A. (now part of the United Kingdom firm Stolt Offshore) yard in Lobito, which is still in existence (under the name Sonamet). According to the fabrication yard directory, this yard has deepwater access and a total workforce of 220 and a permanent production force of 146. The yard was started in 1998 in response to the Angolan offshore construction activity demand for jackets and decks. Phase 2 of the yard development was started in 1999 and is specifically dedicated to deepwater developments.

In addition to competition from foreign international firms operating out yards proximate or distant from the country in which a platform will be installed, GOM fabricators such as McDermott that are part of companies that operate on an international basis face competition from overseas yards that are permanent or temporary components of the international operations. This is particularly evident in Nigeria, where McDermott's U.S. yard participated in eight projects, but McDermott's Nigerian yard participated in 41 projects, and McDermott's Jebel Ali yard participated in two projects.

FORECAST OF DEEPWATER FABRICATION DEMAND

DERIVATION OF DEMAND

The offshore platform fabrication industry is a function of the exploration, discovery, and production of offshore oil and gas resources, as well as the bringing into production of resources that have already been discovered. A Corps of Engineers feasibility study must look at the situation in the long term because Corps projects are assumed to have a 50-year period of analysis in the calculation of costs and benefits. In this particular study, attention must be paid to offshore deepwater fabrication because of the increased ability to participate in deepwater platform markets, which has been claimed as the primary reason for the need for a deeper channel.

Platforms will not be built where there are no offshore oil and gas resources available for exploitation; and, the greatest opportunities lie in the areas where the most resources are available, but only to the degree that platforms are the preferred mode of extraction rather than non-platform alternatives such as subsea. In addition, platforms will not continue to be built if offshore supplies of oil and gas are eventually exhausted through extraction. The latter point is irrelevant to this study because analysts are not predicting that offshore oil and gas resources will be completely depleted during the next 50 years.

The production scenarios that have been prepared by many organizations and individuals, usually presented graphically as production curves, will be pertinent to this analysis. These curves represent estimates of resource availability and the pace of extraction under varying demand/cost assumptions.

Important to the analysis is whether those production curves show acceleration to a peak where production begins to decline. The accelerating side of the curve and the steepness of the acceleration is a good indication of the platform market. The declining side of the curve is a period in which the overall platform market is declining even if new platforms may be needed.

These curves differ by analyst. Considering the time period and the geographic area, most analysts present more than one curve to display different assumptions about the uncertain future. The curves that are most important to this analysis are those that deals with deepwater production worldwide and in various regions, particularly for the GOM. This section deals only with the theoretical studies concerned with long-term production trends. The next part applies a set of curves representing the best available scenarios concerning production trends to project deepwater platform needs by world, region, and platform type over the life of the project.

TOTAL OIL AND GAS

U.S. Geological Survey

The USGS *World Petroleum Assessment 2000* (available online at http://pubs.usgs.gov/dds/dds-060/) was the first to rigorously document the geologic foundation for estimating the undiscovered petroleum resources of the world. The world was divided into approximately 1,000 petroleum provinces, based primarily on geologic factors. Significant petroleum resources are known to exist in 406 of these provinces. Geologists analyzed 159 total petroleum systems containing 270 assessment units and formally assessed 149 total petroleum systems and 246 assessment units located in 128 provinces.

The estimates are for technically recoverable conventional oil and gas and are limited to a 30-year time horizon because beyond that time it is difficult to predict what technologies might be available to extract presently unconventional resources. Estimates are presented for low, high, and mean scenarios. The low estimate represents a 95 percent probability that the resource will equal or exceed that amount. The high estimate represents a 5 percent probability that the resource will equal or exceed that amount.

The United States is not included in this analysis. The USGS estimates the mean total amount of undiscovered, technically recoverable, conventional petroleum (oil, gas, and natural gas liquids) outside of the United States to be about 1,634 billion barrels of oil equivalent (BBOE). Of this total, conventional oil is 649 billion barrels, natural gas is 778 BBOE, and natural gas liquids (NGL) is 207 BBOE. Approximately 612 billion barrels of oil, 551 BBOE of natural gas, and 42 BBOE of NGL are anticipated from reserve growth.

The assessment results (exclusive of the United States) indicate that the Middle East and North Africa region contains 35.4 percent of the world's undiscovered conventional oil, the former Soviet Union contains 17.9 percent, and the Central and South America region contains 16.2 percent. For undiscovered conventional natural gas (exclusive of the United States), the former Soviet Union holds 34.5 percent of the world's total, and the Middle East and North Africa region holds 29.3 percent. For both oil and natural gas, a significant part of the undiscovered resources outside of the Middle East lie offshore in water as deep as 4,000 meters.

The USGS *World Petroleum Assessment 2000* includes separate reports for the eight regions. The report on North America does not include the United States, but does point out that there is a potential for large fields in the southern GOM (in the vicinity of Mexico) in water depths as much as 2,000 meters. The report on Sub-Saharan Africa indicates that more than 75 percent of the undiscovered oil and 73 percent of the undiscovered gas in the region is expected to be offshore, with significant resources in water depths between 2,000 and 4,000 meters, especially in offshore Angola.

Although the United States is not included in this report, Table 6 provides a world summary that includes the U.S. The information on the U.S. is taken from the USGS's 1996 *National Assessment of the United States Oil and Gas Resources* and MMS's 1996 *An Assessment of the Undiscovered Hydrocarbon Potential of the Nation's Outer Continental Shelf.* The USGS contribution to the table relates to onshore areas and beneath state waters, and the MMS contribution to the table relates to offshore Federal waters. As can be seen from the table, the USGS mean estimate is 3,021 billion barrels of world oil and 2,567 BBOE of world gas.

Table 6. World Level Summary of Petroleum Estimates for Undiscovered Conventional Petroleum and Reserve Growth for Oil, Gas, and Natural Gas Liquids (NGL)

	Oil				Gas					NGL			
	Billion Barrels				**Trillion Cubic Feet**				**BBOE**	**Billion Barrels**			
	F95	F50	F5	Mean	F95	F50	F5	Mean	Mean	F95	F50	F5	Mean
World (excluding United States)													
Undiscovered conventional	334	607	1,107	649	2,299	4,333	8,174	4,669	778	95	189	378	207
Reserve growth (conventional)	192	612	1,031	612	1,049	3,305	5,543	3,305	551	13	42	71	42
Remaining reserves				859				4,621	770				68
Cumulative production				539				898	150				7
Total				2,659				13,493	2,249				324
United States													
Undiscovered conventional	66		104	83	393		698	527	88	Combined with oil			
Reserve growth (conventional)				76				355	59	Combined with oil			
Remaining reserves				32				172	29	Combined with oil			
Cumulative production				171				854	141	Combined with oil			
Total				362				1,908	318	Combined with oil			
World Total (including United States)				3,021				15,401	2,567				

Source: U.S. Geological Survey, *World Petroleum Assessment 2000*, Table 1 in "Assessment Results."

Minerals Management Service

The previously mentioned MMS report is produced every five years (with interim updates) and has been superseded by the 2001 *Outer Continental Shelf Petroleum Assessment, 2000* (available online at http://www.mms.gov/revaldiv/pdf_file/brochure7.pdf). The 2000 assessment reflects information available through January 1, 1999, and is based on an analysis of geologic plays. The assessment covers undiscovered conventionally recoverable resources and undiscovered economically recoverable resources and does not independently cover reserves (see MMS 2004 *Estimated Oil and Gas Reserves, Gulf of Mexico, December 31, 2001* for the most recent analysis of GOM reserves).

The results of this analysis are presented in Table 1 of the MMS report, which is reproduced here as Table 7. The low and high estimates are equivalent to those of the USGS. As can be seen from the table, the mean estimate for the GOM portion of the OCS is 37.1 billion barrels of oil and 192.7 trillion cubic feet of natural gas, combined to produce 71.4 billion barrels of oil equivalent. The estimates for the GOM were considerably above (28.8 billion barrels of oil and 97 trillion cubic feet of gas) the 1995 estimates, primarily on the basis of recent deepwater exploration results and additional areas assessed.

Table 7. Estimates of Undiscovered, Conventionally Recoverable Resources for the United States OCS*

Region	Oil (Bbbl)			Natural Gas (Tcf)			BOE (Bbbl)		
	Low	**High**	**Mean**	**Low**	**High**	**Mean**	**Low**	**High**	**Mean**
Alaska	16.5	35.4	24.9	55.0	226.8	122.6	28.0	71.9	46.7
Atlantic	1.9	2.8	2.3	23.9	34.1	28.0	6.2	8.9	7.3
Gulf of Mexico	33.4	44.9	37.1	180.4	207.2	192.7	65.5	81.8	74.1
Pacific	9.0	12.6	10.7	15.2	23.2	18.9	11.8	16.6	14.1
Total OCS**	63.7	88.3	75.0	292.1	468.6	362.2	117.8	166.9	142.2

Notes: Tcf = trillion cubic feet; Bbbl = billion barrels; BOE = barrels of oil equivalent

*Low and High values refer to those estimates that occur at the 95th and 5th percentiles, respectively, on a cumulative distribution curve. The Mean value is the arithmetic average of all values in the distribution.
**Low and High values are not additive to reach the Total values; only Mean values are additive.

Source: Minerals Management Service, *Outer Continental Shelf Petroleum Assessment, 2000*.

The report also presents price supply curves for oil and gas in each OCS region. At high prices, the economic resource volumes approach the conventionally recoverable volumes. The curves represent resources available with sufficient exploration and development efforts and do not imply immediate response to price changes. Mean estimates of undiscovered economically recoverable resources for two oil and two gas price scenarios are presented in Table 8.

Table 8. Mean Estimates of Undiscovered, Economically Recoverable Resources for the United States OCS

Region	$18 Oil (Bbbl)	$2.00 Natural Gas (Tcf)	$30 Oil (Bbbl)	$3.52 Natural Gas (Tcf)
Alaska	3.3	1.6	10.1	3.0
Atlantic	0.5	6.6	1.3	12.8
Gulf of Mexico	17.5	100.3	28.1	140.7
Pacific	5.3	8.3	7.2	11.6
Total OCS	26.6	116.8	46.7	168.1

Notes: Tcf = trillion cubic feet; Bbbl = billion barrels

Source: Minerals Management Service, *Outer Continental Shelf Petroleum Assessment, 2000.*

A table accompanying the report provides estimates for each OCS region by water depth for reserves as well as undiscovered conventionally recoverable resources. The information for the GOM region and subregions respecting undiscovered conventionally recoverable resources is extracted from the table and presented in Table 9.

An update to the report is presented in a December 2004 MMS fact sheet, *Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2003 Update* (available online at http://www.mms.gov/revalidiv/PDFs/2003NationalAssessmentUpdate.pdf). The term "technically recoverable" is equivalent to the term "conventionally recoverable" in the previous report.

Table 9. National Assessment Results by Planning Area and Water Depth as of January 1, 1999: Undiscovered Conventionally Recoverable Resources, GOM

Water Depth Range meters (m)	Undiscovered Conventionally Recoverable Resources								
	Oil (Bbbl)			Gas (Tcf)			BOE (Bbbl0		
	F95	Mean	F5	F95	Mean	F5	F95	Mean	F5
GOM Region	22.821	37.126	56.054	145.088	191.627	246.600	49.851	71.223	97.602
0 – 200m	4.383	4.912	5.788	54.045	56.724	59.958	13.999	15.005	16.457
200 – 800m	3.517	4.144	4.807	18.814	21.046	23.438	6.864	7.889	8.978
800-1,600m	9.929	10.882	11.867	45.446	50.096	59.558	18.016	19.796	22.464
1,600 – 2,400m	10.616	11.984	14.226	43.340	48.148	55.520	18.328	20.551	24.105
>2,400m	3.315	5.147	10.763	12.594	16.967	29.031	5.556	8.166	15.928
Western GOM Area	12.107	12.986	14.220	70.191	74.721	80.360	24.597	26.281	28.518
0 – 200m	0.848	0.979	1.120	19.481	21.377	24.199	4.315	4.783	5.426
200 – 800m	1.760	2.071	2.437	9.053	10.212	11.409	3.371	3.888	4.467
800 – 1,600m	4.197	4.584	4.982	18.927	20.962	24.953	7.565	8.314	9.422
1,600 – 2,400m	3.750	4.167	4.806	15.707	17.456	20.093	6.544	7.273	8.382
>2,400m	0.989	1.180	1.615	4.151	4.733	5.814	1.727	2.022	2.649
Central GOM Area	18.468	20.404	23.767	99.355	105.519	114.177	36.145	39.180	44.083
0 -200m	1.903	2.227	2.783	28.022	29.264	30.466	6.889	7.434	8.205
200 – 800m	1.644	1.930	2.229	8.884	10.138	11.404	3.225	3.734	4.258
800 – 1,600m	5.713	6.206	6.743	25.817	28.686	34.246	10.307	11.310	12.836
1,600 – 2,400m	6.606	7.522	8.992	26.219	29.339	34.180	11.271	12.742	15.074
>2,400m	1.826	2.554	4.740	6.596	8.218	12.803	2.999	4.017	7.018
Eastern GOM Area	2.351	3.576	6.614	10.024	12.306	18.934	4.134	5.766	9.983
0 – 200m	1.287	1.700	2.348	5.769	6.070	6.348	2.314	2.780	3.477
200 – 800m	0.093	0.133	0.213	0.500	0.673	1.033	0.181	0.253	0.397
800 – 1,600m	0.085	0.092	0.099	0.401	0.452	0.550	0.156	0.172	0.197
1,600 – 2,400m	0.253	0.294	0.367	1.175	1.354	1.721	0.462	0.535	0.673
>2,400m	0.458	1.433	4.780	1.767	3.987	11.014	0.772	2.143	6.740

Source: Minerals Management Service, *Outer Continental Shelf Petroleum Assessment, 2000*.

The results are presented here in Table 10. As can be seen from the tables, the estimate for GOM oil has remained flat, but the estimate for GOM gas has increased by over 20 percent in relation to the 2000 study, primarily as a result of new drilling and discoveries.

Table 10. Undiscovered Technically Recoverable Resources of the OCS

Undiscovered Technically Recoverable Resources									
	UTRR Oil (Bbbl)			**UTRR Gas (Tcf)**			**UTRR BOE (Bbbl)**		
	F95	**Mean**	**F5**	**F95**	**Mean**	**F5**	**F95**	**Mean**	**F5**
Alaska OCS	16.6	25.1	35.9	54.6	122.1	226.2	28.0	46.9	72.1
Atlantic OCS	1.9	3.5	5.3	19.8	33.3	50.6	5.4	9.4	14.3
Gulf of Mexico OCS	31.5	36.9	44.0	208.9	232.5	267.6	68.7	78.3	91.6
Pacific OCS	4.4	10.5	21.8	7.4	18.2	38.2	5.7	13.7	28.6
Total OCS	62.1	76.0	93.0	326.2	406.1	520.0	122.0	148.3	180.4

Notes: Bbbl = billion barrels of oil; Tcf = trillion cubic feet of natural gas.
F95 indicates a 95 percent chance of at least the amount listed,
F5 indicates a 5 percent chance of at least the amount listed.
Only mean values are additive.

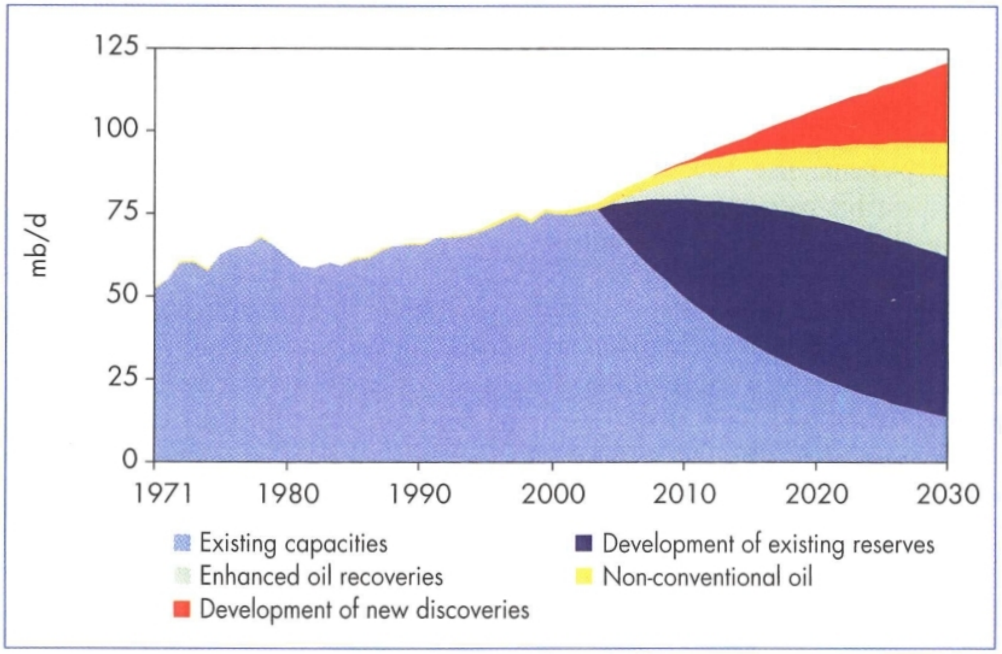
Source: Minerals Management Service, *Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2003 Update.*

International Energy Agency

The *World Energy Outlook* is published every two years by the International Energy Agency, with the latest edition being for 2004. This publication covers all energy sources and provides projections to 2030. A chapter is devoted to world oil, and the major conclusions are presented in the publication’s Executive Summary: “Fossil-fuel resources are, of course, finite, but we are far from exhausting them. The world is not running out of oil just yet. Most estimates of proven oil reserves are high enough to meet the cumulative world demand we project over the next three decades. Our analysis suggests that global production of conventional oil will not peak before 2030 if the necessary investments are made.”

The conclusion is represented graphically here as Figure 2. This is the reference (or mid) scenario, which is based on the USGS mean resource estimate of 3,345 billion barrels of ultimately recoverable resources. The illustration masks the fact that the accompanying text and table indicate that conventional oil production will peak between 2028 and 2032 (that is, at the right edge of the illustration). Additional scenarios are presented for a high resource case and a low resource case. The high resource case assumes a 10 percent probability that all the oil will be recovered, which provides a peak period for conventional oil production between 2033 and 2037. The low resource case assumes a 90 percent probability that all the oil will be recovered, which provides a peak period for conventional oil production between 2013 and 2017.

Figure 2: Strong Growth Trend in Deepwater Floaters



Source: International Energy Agency, *2004 World Energy Outlook.*

With respect to regions that are particularly relevant to this study, IEA maintains that:

1. Oil production in North America is expected to pick up slightly during the next few years, primarily as a result of a surge in output in the GOM; but beginning in the 2010s, the region is expected to resume its long-term trend, as output in Alaska, Western Canada, and the lower 48 states tails off. Older fields in the GOM will also peak soon. New fields in ultra-deep offshore waters will not be able to compensate for this decline.

2. Egypt, Ivory Coast, Equatorial Guinea, and Sudan are expected to produce more in 2010. In Angola, production will grow, driven mainly by new deepwater fields. Nigeria has large estimated reserves, and the startup of deepwater fields is boosting production.

3. Production in Latin America is expected to grow dramatically through 2030. Brazil has a huge potential for further discoveries and will account for much of the increase in oil production in Latin America over the projection period.

With respect to natural gas, the International Energy Agency indicates that consumption of natural gas worldwide will almost double by 2030, driven mainly by power generation. Gas-to-liquids plants will emerge as a new major market for natural gas, making use of reserves located far from traditional markets. Global capacity is projected to reach 2.4 million barrels a day by 2030, but the rate of construction of gas-to-liquids plants is difficult to predict, although most are expected to be built in the Middle East.

Gas resources can easily meet the projected increase in global demand. Proven reserves have outpaced production by a wide margin since the 1970s and are now equal to about 66 years of production at current rates. Production will increase most in Russia and in the Middle East, which between them have most of the world's proven reserves. Most of the incremental output in these regions will be exported to North America, Europe, and Asia, where indigenous output will fall behind demand.

<u>Energy Information Administration</u>

The EIA is part of the U.S. Department of Energy and is responsible for the official energy statistics for the U.S. Government. The EIA has produced the *Annual Energy Outlook 2005*, which deals with domestic demand and supply for all energy sources, and the *International Energy Outlook 2004*, which deals with international demand and supply for all energy sources. The international volume, which is more inclusive and available online at http://www.eia.doe.gov/oiaf/ieo/, will be used for this analysis.

EIA provides oil production projections through 2025 for a high oil price scenario, a low oil price scenario, and a reference case scenario. The reference case scenario prices per barrel of oil are $24.17 in 2010, $25.07 in 2015, $26.02 in 2020, and $27.00 in 2025. The oil resource base is defined as proved reserves, reserve growth, and undiscovered. Reserve numbers are obtained from the annual assessments in the *Oil and Gas Journal*, and undiscovered estimates are obtained from the USGS 2000 report. The reference case projections (in millions of barrels per day) are 91.1 in 2010, 100.2 in 2015, 110.0 in 2020, and 120.6 in 2025. U.S. production is expected to decrease from 9.5 million barrels a day in 2010 to 9.3 in 2015, 8.9 in 2020, and 8.6 in 2025. In addition, natural gas production (in trillions of cubic feet) is projected to increase from 105.5 in 2010 to 118.5 in 2015, 134.5 in 2020, and 151.0 in 2025. U.S. production is expected to increase from 20.5 in 2010 to 21.6 in 2015, 23.8 in 2020, and 24.0 in 2025.

The EIA report does not deal specifically with the peak oil production issue, but rather refers to an article by John Wood, Gary Long, and David Morehouse of the EIA titled "World Conventional Oil Supply Expected to Peak in 21st Century" (with the subtitle "Future is Neither Bleak nor Rosy") in the April 2003 *Offshore* and available online at http://ogj.pennnet.com/articles/articledisplay.cfm?Section=ARCHI&C=Techn&ARTICLE_ID=173967&KEYWORDS="world%20conventional%20oil%20supply%20expected%20to%20peak%20in%2021st%20century". Another version of this article under the title "Long-Term World Oil Supply Scenarios: The Future is Neither as Bleak or Rosy as Some Assert" is available on EIA's webpage at http://www.eia.doe.gov/pub/oil_gas/petroleum/feature_articles/2004/worldoilsupply/oilsupply04.html. The information in the article in a slide presentation format is available on EIA's webpage at http://www.eia.doe.gov/pub/oil_gas/petroleum/presenations/2000/long-term_supply/sld001.htm.

These articles and the slide presentation apply four world oil production annual growth rates (0, 1, 2, and 3 percent) to the USGS's high, mean, and low probability estimates for the world conventional oil resource base to produce 12 peak year production forecasts (as shown in the table in the articles, which is reproduced here as Table 11).

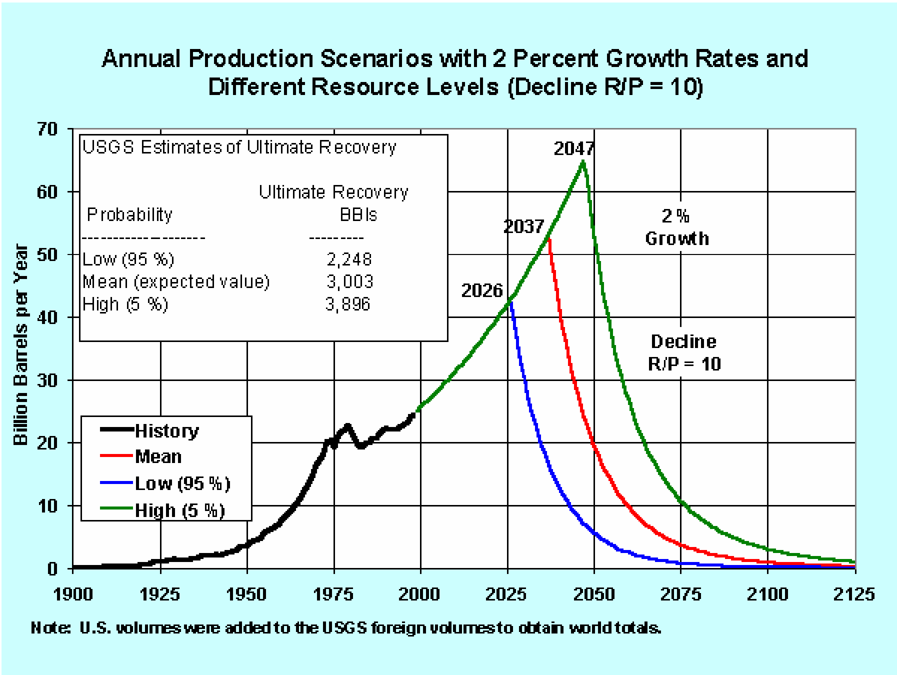
Table 11. World Oil Production Forecast

Probability Estimate	Ultimate Recovery BBbls	Annual Demand Growth, %	Peak Year	Peak Rate, MMBbls/yr	Peak Rate, MMBbls/day
Low (95%)	2,248	0.0	2045	24,580	67
	2,248	1.0	2033	34,820	95
	2,248	2.0	2026	42,794	117
	2,248	3.0	2021	48,511	133
Mean (expected value)	3,003	0.0	2075	24,580	67
	3,003	1.0	2050	41,238	113
	3,003	2.0	2037	53,209	146
	3,003	3.0	2030	63,296	173
High (5%)	3,896	0.0	2112	24,580	67
	3,896	1.0	2067	48,838	134
	3,896	2.0	2047	64,862	178
	3,896	3.0	2037	77,846	213

Source: Energy Information Administration, "Long-Term World Oil Supply."

Particular emphasis is placed on the 2 percent production growth rate because world crude oil demand has been growing at an annualized compound rate slightly in excess of 2 percent in recent years. This growth rate is applied to the three probability estimates used to produce Figure 2 in the articles, which is reproduced here as Figure 3. Under this assumption and using the mean estimate, world oil production can be expected to peak in 2037 at 53.2 billion barrels per years.

Figure 3. Annual Production Scenarios with 2 Percent Growth Rates and Different Resource Levels (Decline R/P=10)



Source: Energy Information Administration, "Long-Term World Oil Supply."

The EIA materials cite some of the other analysts who predict a nearer peak oil year and point out that these differences are based on recoverability assumptions rather than on geologic issues. EIA believes that the USGS estimates are conservative because they are limited to 30 years and do not include unconventional sources of crude oil such as tar sands and very heavy oil.

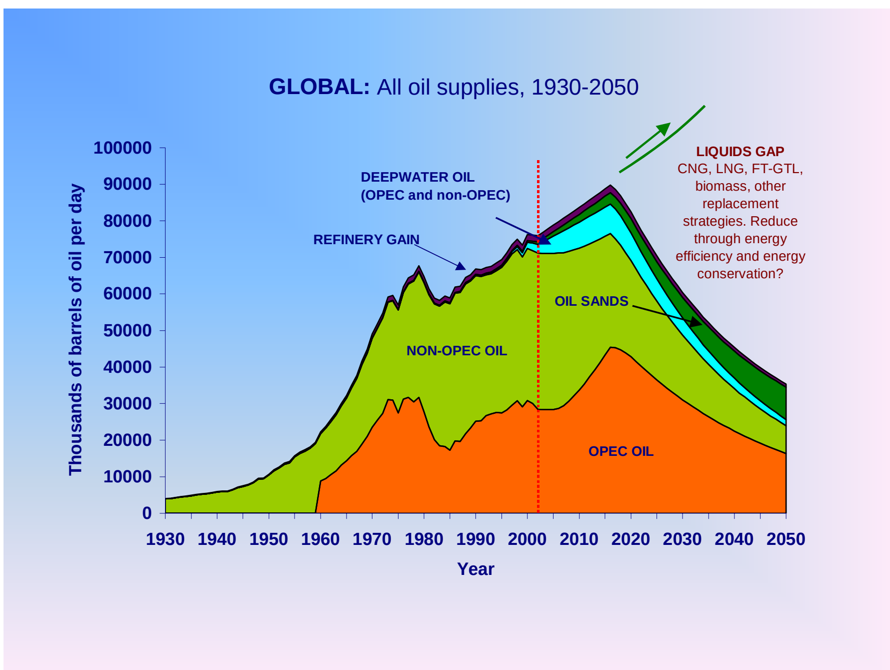
Douglas-Westwood/EnergyFiles

Douglas-Westwood is a British energy analyst, and EnergyFiles is a British oil and gas forecaster. Together, they produce *The World Oil Supply Report: 2004-2050*, *The World Gas Supply Report: 2004-2025*, and *The World Offshore Oil and Gas Forecast: 2005-2015*. Consequently, they can be considered a single entity for purposes of this analysis. *The World Oil Supply Report: 2004-2050* quantifies all known and yet to be found oil reserves and resources (conventional sources, deepwater oil, gas substitutes, and tar sands) and, using four demand growth scenarios, provides for every country, region, OPEC, and the world oil reserve resource estimates and a 1930-2050 production profile. GEC did not obtain a copy of this report because of its high cost, because GEC did not have the technical capacity to translate production profiles into platform demand, and because Infield is closely associated with Douglas-Westwood/Energy Files.

The key elements of the Douglas-Westwood/EnergyFiles analysis are available through Michael Smith's April 2003 slide presentation "World Oil Resources and Peak Oil Production," which is available online at http://www.energyfiles.com/information/presentations.htm). Douglas-Westwood/Energy Files assumes 1,274 billion barrels of yet-to-produce oil, constituted by 1,004 billion barrels in remaining reserves and 270 billion barrels in yet-to-find resources. The world oil production peak will occur in 2018 at 80 million barrels a day at a flat demand growth rate, in 2015 at 86 million barrels a day at a 1 percent demand growth rate, in 2011 at 90 million barrels a day at a 2 percent growth rate, and in 2007 at a 3 percent demand growth rate.

Douglas-Westwood/EnergyFiles presents a production graphic for the 1 percent demand growth rate for world oil in slide 31 of the presentation (which is reproduced here as Figure 4), with the observation that at least 1 percent is needed for world economic growth. Embedded in the graphic is an estimate for deepwater oil, which will peak about the same time as world oil and will constitute only 10 percent of that peak.

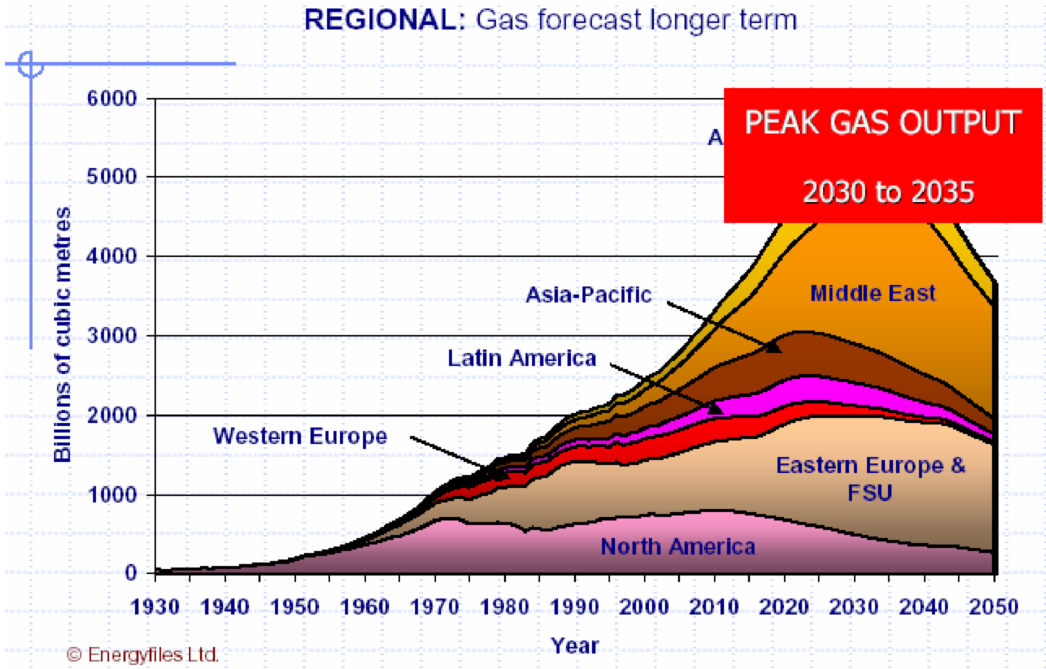
Figure 4. Global: All Oil Supplies, 1930-2050



Source: Michael Smith, "World Oil Resources and Peak Oil Production."

The long-term gas supply is addressed in Michael Smith's November 2004 slide presentation "Satisfying Long Term Global Gas Demand?" (available online at the same place). As can be seen from slide 33 of the presentation, which is reproduced here as Figure 5, Douglas Westwood/EnergyFiles projects peak gas output to occur between 2030 and 2035 and that North America will experience declining output.

Figure 5. Regional: Gas Forecast Longer Term



Source: Michael Smith, "Satisfying Long Term Global Gas Demand?"

DEEPWATER OIL AND GAS

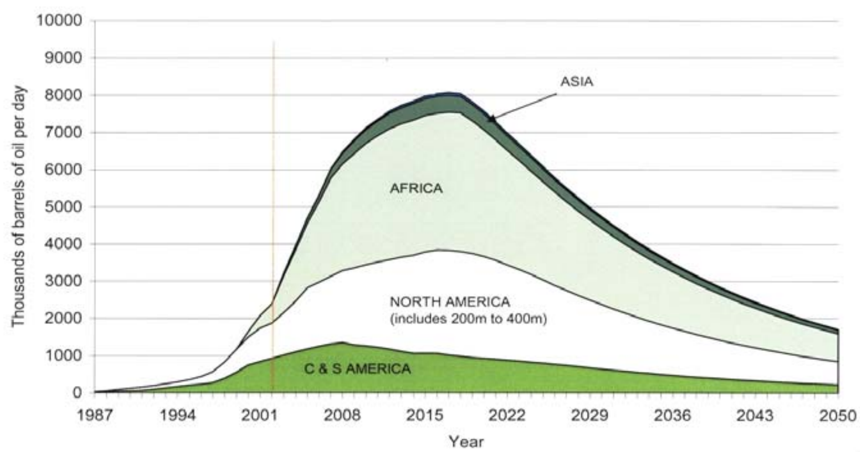
DOUGLAS-WESTWOOD/ENERGYFILES

Douglas-Westwood/EnergyFiles provides a number of other perspectives on deepwater oil and gas through papers and slide presentations available through the Douglas-Westwood webpage at http://www.dw-1.com/filemaster/t_publicfiles_template.php?filecategory=Published+Papers+%26+Articles. The most important of these from the perspective of the present analysis is the February 2004 slide presentation "Deep and Ultra-Deepwater Investment Trends" (Deepwater Prospects) by John Westwood and Steve Robertson.

The definition of deepwater has moved from 200 meters in 1998 to 500 meters in 2002, with ultra-deepwater defined as 1,000 meters or greater. Many future prospects are offshore, but capital expenditures in mature shallow markets are in decline. The focus is now on deep and ultra-deepwater.

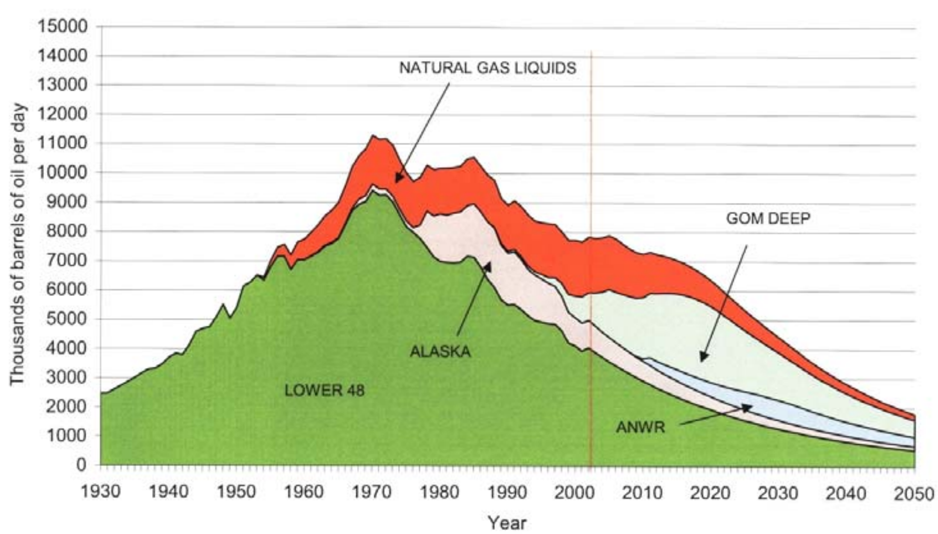
Deepwater oil production is at 2.5 million barrels a day (February 2004), constituting about 3 percent of total world production. Deepwater oil production will at least triple over the next decade. However, it will peak around 2017 at slightly more than 8 million barrels a day (as shown in Figure 6). Deepwater will become the major source of oil in the U.S., but peak production will occur about the same time as world peak deepwater production (as shown in Figure 7).

Figure 6. Deepwater Oil Production Through 2050



Source: John Westwood and Steve Robertson, "Deep and Ultra-Deepwater Investment Trends."

Figure 7. U.S. Oil Production Through 2050



Note: ANWR = Alaska's Arctic National Wildlife Reserve.
Source: John Westwood and Steve Robertson, "Deep and Ultra-Deepwater Investment Trends."

MERRILL LYNCH

Production peaks for the Big Four deepwater production areas are presented by Ivan Sandrea of Merrill Lynch in London in “Deepwater Discovery Rate May Have Peaked: Production Peak May Follow in 10 Years” (*Oil and Gas Journal*, July 26, 2004). The objective of the study was to develop conclusions through a multi-disciplinary appraisal of deepwater (defined as 500 meters or greater) Angola, Brazil, Gulf of Mexico, and Nigeria (Big Four regions) that integrates well, geological, and field data to provide an estimate for: (1) ultimate oil reserves potential, including yet-to-find; and (2) peak oil production for each of the Big Four regions.

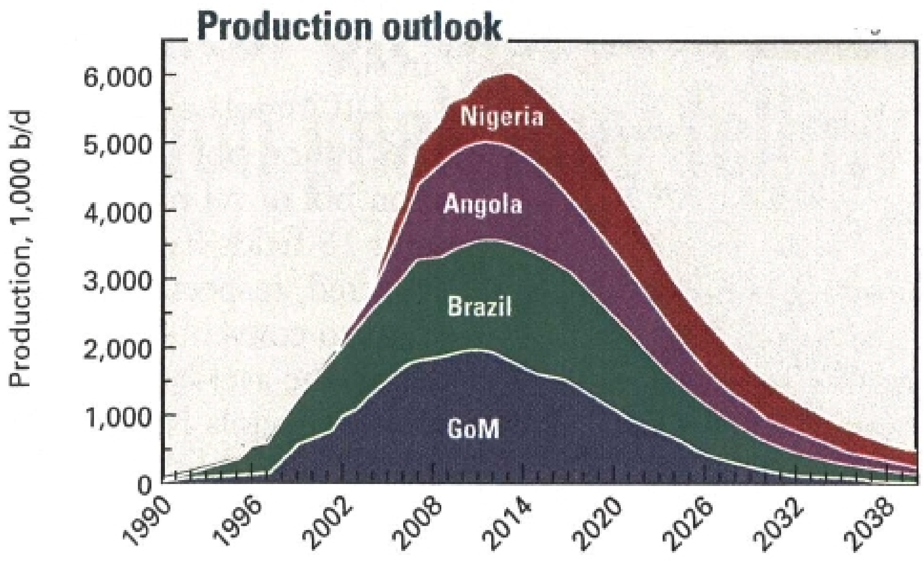
Discovered oil reserves were estimated based on field-by-field data available to yearend 2003 and comprise proven and probable oil reserves for each oil and gas discovery. Yet-to-find oil reserves were estimated by extrapolating the hyperbola of cumulative oil reserves discovered in each province to yearend 2003 plotted against cumulative exploration wells produced. The underlying principle is that once the larger discoveries have been found (which happens early), they set the parameters of the hyperbola that may be extrapolated to the smallest discovery, using estimates for expected reserves per well, expected success rates, etc., based on a given number of wells to be drilled in the future.

The article indicates that deepwater oil discoveries in the Big Four peaked at 5.8 billion barrels in 1996. For the four regions, oil discoveries in Brazil peaked in 1987. In the Gulf of Mexico, they peaked in 1999 and would have peaked in 1989 if Thunder Horse had not been discovered. In Angola and Nigeria, oil discoveries peaked in 1998 and 1996, respectively, three years after the first acreage became available. In the five-year period to yearend 2003, key exploration parameters (especially success rate, discovery size, and reserves per well) showed a deteriorating trend despite an increase in drilling in all four regions, except for the GOM, where the number of deepwater exploration wells was halved from 2001 to 2003.

Yet-to-find oil reserves in the Big Four could be 10-12 billion barrels, a volume roughly equal to 25 percent of the discovered reserves at yearend 2003, despite the fact that over 1,000 exploration wells are likely to be drilled. The large acreage already covered by drilling and 3D seismic relative to the total acreage available and the high concentration of deepwater prospect possibilities in a single geological formation and basin provides a high level of certainty with the yet-to-find results obtained for Brazil, Angola, and Nigeria. In the case of the GOM, yet-to-find resources are estimated at 4BBOE, which is well below the recent Energy Information Administration estimate of 57BBOE. Given the size of the province, thickness of the hydrocarbon-rich rock formations, and the high number of blocks relinquished relative to those that are drilled, it is possible that some areas have not been thoroughly explored. However, future discoveries in the GOM are likely to be smaller than in the other provinces, posing great challenges for development.

The study concludes that total deepwater production from the Big Four could peak at 6.2-6.4 million barrels a day sometime during 2011-2013. As shown in Figure 8, deepwater oil production in Brazil could peak in 2014, in Nigeria in 2013, and in the GOM and Angola in 2011. Since the first deepwater exploration well was drilled 30 years ago, the industry has seen or tested nearly every geologically important corner of the world, onshore or offshore, deep or shallow reservoirs, in search for oil and gas. Outside the Big Four, there is limited potential. The global exploration potential now looks more limited than ever.

Figure 8. Deepwater Oil Production Outlook for the Big Four



Source: Ivan Sandrea, "Deepwater Discovery Rate May Have Peaked: Production Peak May Follow in Ten Years." *Oil and Gas Journal*, July 26, 2004.

WOOD MACKENZIE/FUGRO ROBERTSON

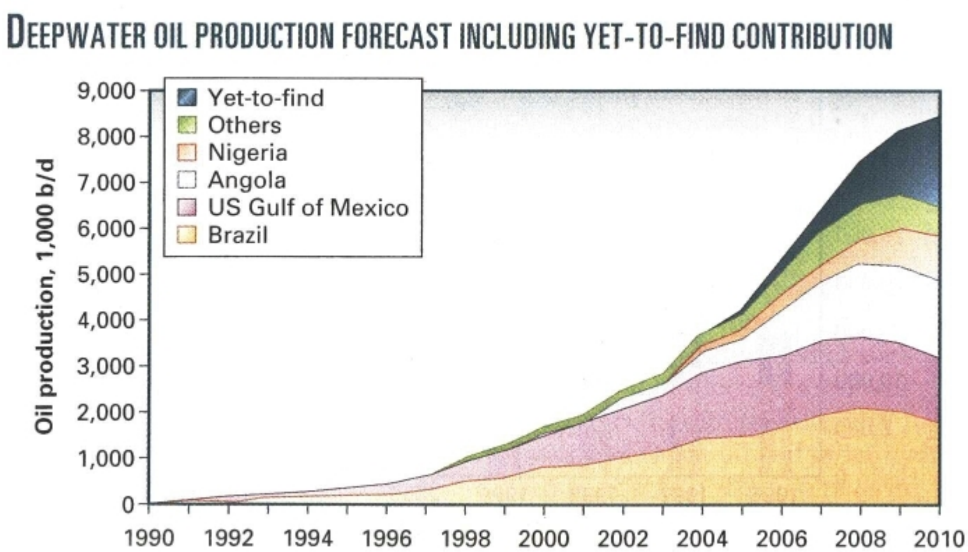
Wood Mackenzie is an international company headquartered in Scotland that provides research services and strategic advice to the energy industry. Fugro Robertson is headquartered in the Netherlands and specializes in geoscience investigations for the oil and gas industry. Together, they produced *The Future of Deepwater: Analysis of Possible Scenarios*, which concentrates on yet-to-find deepwater oil and gas in Angola, Australia, Brazil, Canada, Congo, Cote d'Ivoire, Egypt, Equatorial Guinea, India, Indonesia, Malaysia, Mauritania, Mexico, Mozambique, Nigeria, Norway, Trinidad & Tobago, and the U.S. Gulf of Mexico.

The study is briefly summarized in "Deep Water to Play Key Role in New Reserves, Production" (*Oil and Gas Journal*, July 26, 2004). According to the article, the two firms compared global deepwater exploration results with overall exploration results during the 1996 to 2003 timeframe and built their oil production forecast based on all known field developments, discoveries likely to be commercialized over the next few years, and the prospective contribution from yet-to-find resources.

Oil and gas reserves discovered worldwide in new fields have declined from 15-30 BBOE a year during 1996-2000 to about 10 BBOE/year since 2001; but much of this decline relates to gas discoveries and to nondeepwater exploration. Deepwater gross discovery volumes (particularly oil) show only a gentle downward trend, so that the relative contribution of deepwater to overall exploration results is increasing.

In 2004, deepwater will supply about 5 percent of global oil demand. By 2010, this share of global supply will have risen towards 9 percent. As shown in Figure 9, deepwater oil production should reach about 8.5 million barrels a day by 2010, including two million barrels a day from yet-to-find resources. Yet-to-find potential is 182 BBOE, including 68 BBOE of gas and 114 BBOE of oil. In recent years, annual global deepwater discovery rates have been about 8 BBOE. At this discovery rate, the yet-to-find potential will require two to three decades of further exploration effort.

Figure 9. Deepwater Oil Production Through 2010



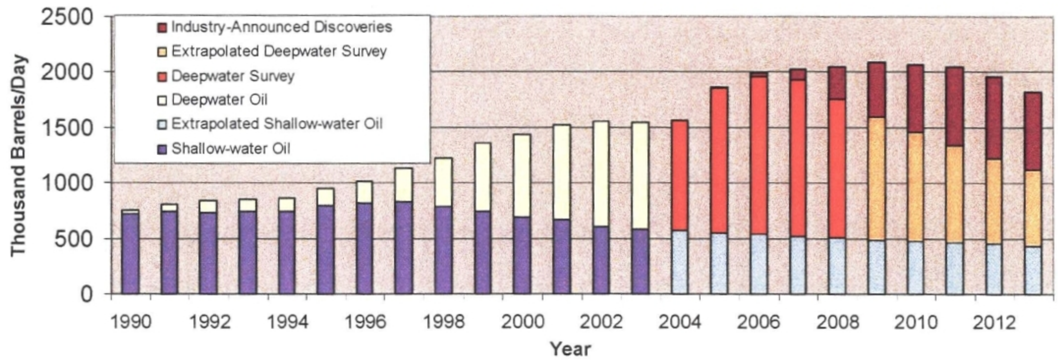
Source: "Deep Water to Play Key Role in New Reserves, Production," *Oil and Gas Journal*, July 26, 2004.

In absolute value terms, the greatest opportunity for deepwater exploration is in the GOM, which has a vast resource potential and features high post-tax oil and gas values. Mexico may join the Big Four as a primary producer, and Australia and Egypt have comparable resource potentials, primarily in the form of gas. In the long-term, as markets are established for this gas, the deepwater industry could comprise a "Big Seven."

MINERALS MANAGEMENT SERVICE

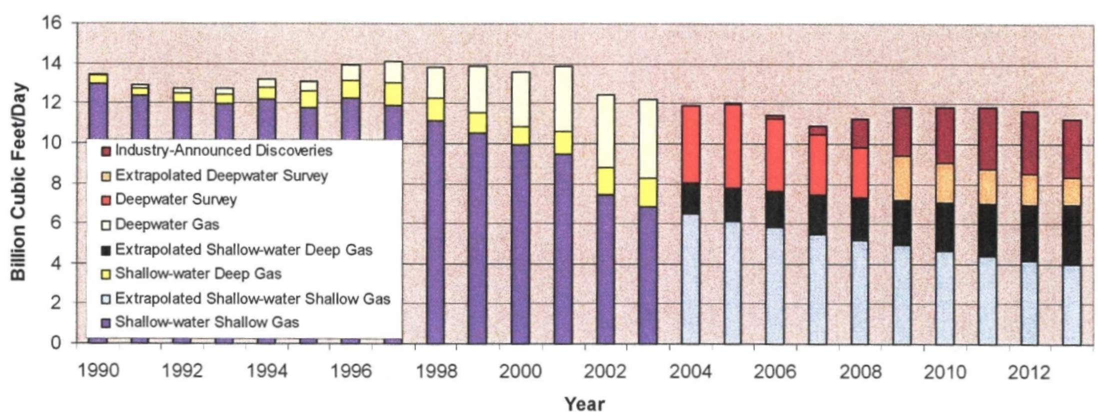
The October 2004 *Gulf of Mexico Oil and Gas Production Forecast: 2004-2013* was produced by MMS staff and provides daily shallow and deepwater oil and gas production rate forecasts for the GOM OCS for the years 2004-2013. A deepwater project is defined as one with a production facility located in a water depth equal to or greater than 1,000 feet (305 meters). As a result of Federal incentives many gas wells are now being drilled in shallow water, but to much greater depths underground. These wells are classified as shallow-water deep gas. The first section of the report presents historic trends. The second section provides a five-year forecast based on a survey of deepwater operators. The third section extends the forecast out 10 years on the basis of additional industry announced discoveries. The fourth section adds potential production from yet-to-find deepwater projects on the basis of analyses of historical discovery and production trends. The results for oil and gas are shown in Figures 10 and 11, respectively.

Figure 10. Total GOM Oil



Source: MMS, 2004, *Gulf of Mexico Oil and Gas Production Forecast: 2004-2013*.

Figure 11. Total GOM Gas



Source: MMS, 2004, *Gulf of Mexico Oil and Gas Production Forecast: 2004-2013*.

The MMS long-range projection of deepwater projects that industry has indicated they intend to pursue shows oil production will drive the increase in the coming years. After these projects reach their production peaks, MMS believes that the anticipated two million barrels of oil per day can be maintained if operators commit to developing existing discoveries and continue to explore the deepwater frontier. In 2003, operators announced 13 discoveries in deepwater; and by the time the report was produced in 2004, another 10 had been announced. Gas production is expected to show a short-term decline and then to increase again as new wells in deep-shelf and deepwater areas come into production.

The Resource Evaluation Division of MMS is located in Herndon, Virginia, and is responsible for regulation of geological and geophysical data collection connected with the OCS, data acquisition and analysis, resource assessment, resource estimation, tract evaluation/fair market value determination, reserves inventory, and technical information distribution. The Division is presently conducting a study of OCS long-term deepwater (defined as 1,000 feet of water or greater) resources. The results of this study are not available at this time.

PLATFORM MARKET

There are only a few firms worldwide that provide short-term projections for the offshore production platform market. These projections generally do not exceed five years and are based on decided and highly probable projects by oil and gas producers. The cost of these analyses (in published format) or acquisition of the information through database access is very high. Sufficient information is available in the open literature to determine the basic results of the short-term projections. ODS-Petrodata in Houston provides short-term projections, but these are for the operational costs and geographic distribution of oil and gas drilling rigs, which is a market entirely different from that of the production platform market. No firms routinely provide long-term projections for the offshore production platform market. Infield was chosen to conduct the long-term analysis for this study because of its recognized expertise and the fact that it had demonstrated a willingness to extend its analysis beyond five years.

SHORT TERM MARKET

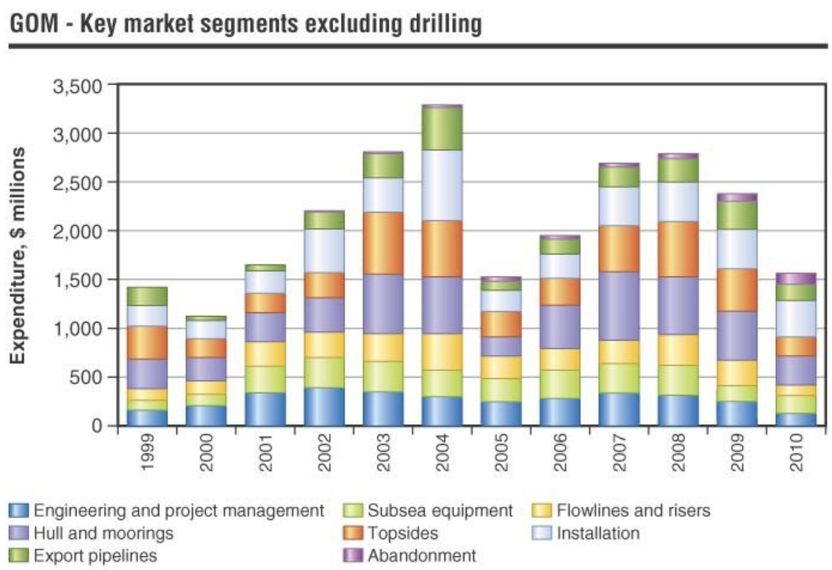
PFC Energy

PFC Energy is a U.S. based firm that provides strategic advice to the energy industry and publishes the *Global Liquids Supply Forecast* (through 2020). A perspective on PFC Energy's analysis of short-term deepwater markets is presented by Jason Nunn in "Deepwater Growth for 2005 Specific to Regions," which appeared in the December 2004 *Offshore*

According to PFC Energy, the deepwater sector has grown strongly into a major segment of the offshore market since operators developed the first projects in water depths over 1,000 feet in 1985. During the first 10 years, the market grew an average of 65 percent per year and was fairly evenly split between Northwest Europe, Brazil, and the Gulf of Mexico. In the second 10-year period, the market in these core areas stabilized, and development of West Africa drove growth. This is particularly true in the last five years and has culminated in West African projects making up 51 percent of the deepwater market in 2005. Again, throughout this period, the deepwater market has experienced sustained growth, and although there have been regional fluctuations, the overall market has remained resilient to exploration and production (E&P) spending fluctuations caused by oil price variations. Only year 2000 showed a substantial fall in the size of the overall market, and on average, growth of 10 percent to 20 percent per annum has been achieved. However, the trend indicates that the market has been maturing. Whether this can be reversed is a matter for debate.

The results of the analysis for the GOM are shown in Figure 12. The deepwater market was experiencing a strong growth path, but was expected to decline dramatically in 2005 as a result of lack of project sanctions in 2003 and 2004. The decline was expected to be felt particularly within the fabrication and installation sectors, with expenditures on engineering, project management, subsea equipment, and flowlines and risers remaining fairly stable. A return to the 2003 expenditure levels of $2.25 billion a year is expected in 2007 and 2008, after which the market will probably dip, reflecting the strong five-year cycle that characterizes the GOM market.

Figure 12. GOM Key Market Segments



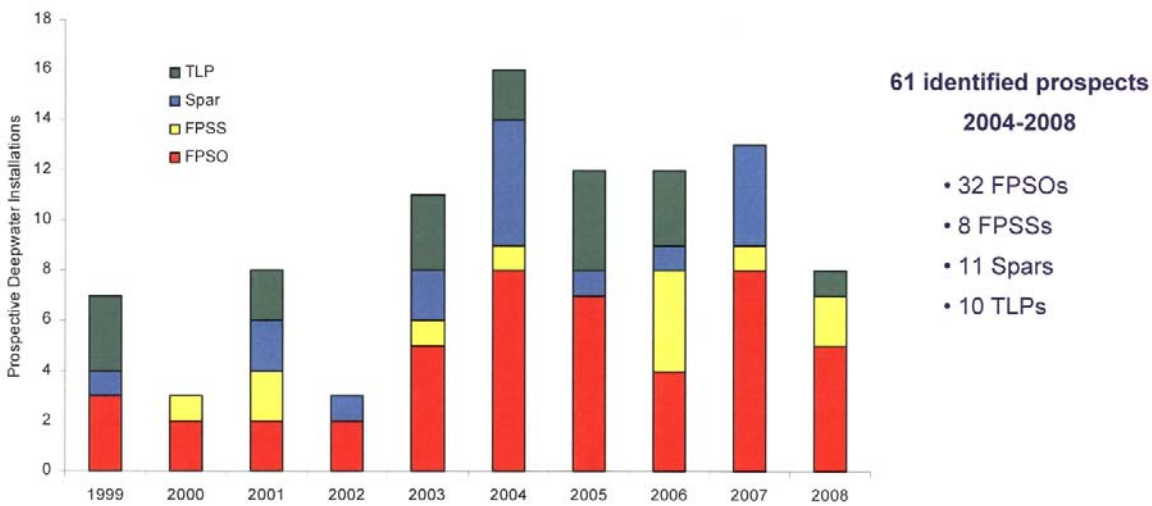
Source: “Deepwater Growth for 2005 Specific to Regions,” *Offshore*, December 2004.

Of the total $48 billion that PFC Energy expects to be expended in the 2005-2009 period, 42 percent will be allocated to West Africa, 22 percent to North America, 16 percent to South America, 12 percent to Southeast Asia, 6 percent to Northwest Europe, and 2 percent to North Africa and the Mediterranean. Beyond 2009-2010, the potential development of deepwater reserves in Mexico and stranded deepwater gas reserves in Asia, West Africa, and Russia all provide ample opportunity for further growth in the sector. However, the timing of developments in these areas will determine whether or not the total market will grow, or merely ensure it is sustained at $8 billion to $10 billion/year. In this regard, it took approximately seven years for expenditures in West Africa, Brazil, Asia, and the GOM to reach approximately $1 billion. So, allowing for drilling, it would not be unreasonable to expect it to be 2015 before deepwater Mexico becomes a significant investment area with non-drilling capital investment exceeding $1 billion/year.

Douglas-Westwood

Douglas-Westwood's perspective on the short-term deepwater platform market is contained in the January 2004 presentation by John Westwood titled "Global Offshore Prospects". Slide 22 of this presentation is reproduced here as Figure 13. With respect to deepwater floating production systems, Douglas-Westwood identifies for the 2004-2008 period 61 prospects, including 32 FPSOs, 8 FPSSs, 11 Spars, and 10 TLPs.

Figure 13. FPS Deepwater Installation Prospects



Source: John Westwood, "Global Offshore Prospects."

It should be kept in mind that these numbers refer only to deepwater floating production systems, which constitute only part of the floating production system market. For floating production systems at all water depths, Douglas-Westwood identifies 124 prospects for the 2004-2008 period.

Infield

Infield is a London-based firm with a Houston office that supplies information on the worldwide oil and gas industry to business executives through a wide range of databases, publications, and analytical services. Infield's worldwide database is called the Offshore Energy Database, which covers all aspects of the offshore oil and gas industry. It is incorporated into Infield's proprietary OFFPEX modeling system to forecast the scheduling and value of projects component by component, taking into account macroeconomic, techno economic, and business processes.

Infield/Douglas-Westwood's *The World Deepwater Report IV: 2003-2007* contains information on platforms by type, location, and value for the period 1998-2007. This report has been superseded by the *Deep & Ultra-deepwater Report Market Update 2005/09*, which was not obtained for this study because it was assumed that the short-term forecast would be a component of the long-term forecast that Infield was commissioned to conduct as part of this study.

Infield's perspective on the total floating production system market is contained in its publication *Floating Production Systems Report Market Update 2005/09*. A summary, which is available at http://www.infield.com/floating_production_market_report.htm, identifies 166 operational floating production systems (FPSOs, FPSs, TLPs, and Spars, see Figure 1), 26 under construction or conversion, and 122 prospects for 2005-2009.

The deepwater component of this overall market is contained in Table 6-5 of the report specially prepared by Infield for this study (*Offshore Construction Industry – A Long-Term View*, which shows 67 floating production systems for the period 2005-2009 including 40 FPSOs, 15 TLPs, 7 FPSs, and 5 Spars. The primary reason for the difference between the total and deepwater numbers is that many FPSOs (see Figure 1) presently operate in shallow water and this will be the case in the future.

LONG-TERM MARKET

CENTER FOR ENERGY STUDIES

The *Long-Term Oil and Gas Structure Installation and Removal Forecasting in the Gulf of Mexico: A Decision and Resource Based Approach* was prepared for MMS by the LSU Center for Energy Studies in May 2004. Forecasts consist of the annual number of major and nonmajor structures that will be installed and removed in the central and western GOM through 2040.

Major structures include platforms or satellites with six completions or more, or at least two pieces of production equipment. Water depth was disaggregated for the study by 0-200 meters, 201-400 meters, 401-800 meters, 801-1,000 meters, and 1,000+ meters. Oil and gas resource estimates were obtained from MMS's national assessment, and the number of platforms required to extract those resources was extrapolated from historic data.

The results for the central and western GOM are presented in Tables 12 and 13, respectively. The supply curve parameter (p) is one that must be chosen by the user. If, for example, the user assumes that 50 percent of the available oil and gas resources will be recovered by 2040, 1.0 major structures will be installed annually in 201-800 meters of water in the Central GOM and 1.5 in the Western GOM; and 2.3 major structures will be installed annually in 800+ meters of water in the Central GOM and .5 in the Western GOM.

The 100 percent recovery figure is indicative of the number of platforms that the authors believe would be necessary to extract all of the resources, no matter what the time period. Assuming 100 percent recovery for the period from 2000 through 2040 would require 10.7 platforms per year for water depths exceeding 200 meters throughout the GOM, or a total of 428 platforms for the 40-year period.

Table 12. Forecast of the Annual Number of Major and Nonmajor Structures Installed and Removed in the Central GOM through 2040 as a Function of Water Depth and Supply Curve Parameter *p*

Water Depth (m)	*p*	Major Installed	Nonmajor Installed	Major Removed	Nonmajor Removed
0-200	0.25	0.2	0.2	34.2	56.1
	0.50	0.2	10.5	40.7	67.8
	0.75	0.6	20.8	47.2	79.5
	1.00	1.5	31.2	53.7	91.2
201-800	0.25	0.5	0.1	-	-
	0.50	1.0	0.2	0.1	-
	0.75	1.4	0.3	0.1	-
	1.00	1.9	0.4	0.1	-
800+	0.25	1.1	0.6	-	-
	0.50	2.3	1.1	-	-
	0.75	3.4	1.7	-	-
	1.00	4.6	2.3	-	-

Source: OCS Study MMS 2004-009.

Table 13. Forecast of the Annual Number of Major and Nonmajor Structures Installed and Removed in the Western GOM through 2040 as a Function of Water Depth and Supply Curve Parameter *p*

Water Depth (m)	*p*	Major Installed	Nonmajor Installed	Major Removed	Nonmajor Removed
0-200	0.25	1.1	1.5	11.3	11.9
	0.50	5.4	4.4	15.4	16.5
	0.75	10.1	7.3	19.5	20.9
	1.00	14.4	10.2	23.7	25.4
201-800	0.25	0.8	0.2	0.1	0.1
	0.50	1.5	0.4	0.1	0.1
	0.75	2.3	0.6	0.2	0.2
	1.00	3.0	0.8	0.3	0.3
800+	0.25	0.3	0.3	-	-
	0.50	0.6	0.6	-	-
	0.75	0.9	0.9	-	-
	1.00	1.2	1.2	-	0-

Source: OCS Study MMS 2004-009.

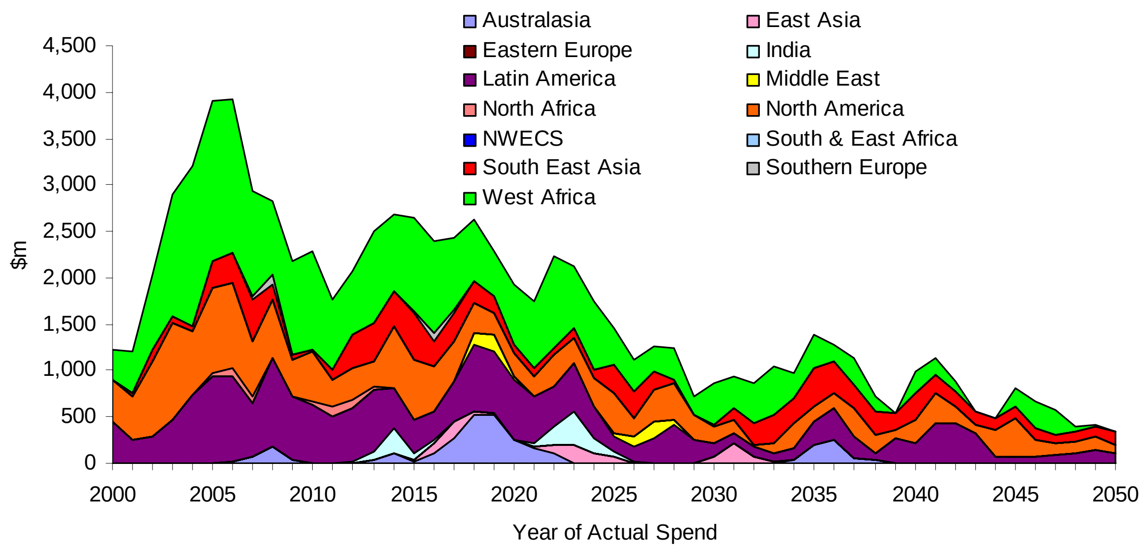
INFIELD

Infield was chosen to conduct a long-term platform market analysis for this study because: (1) it is a specialist with respect to the relevant data, (2) it is a private firm that supplies data and analyses to the oil and gas industry that must be reasonable for the firm to survive, and (3) it had demonstrated a willingness, through a February 2004 slide presentation ("Deepwater-The Key Sectors"), to extend its analysis of the dollar spend on platform types beyond the normal five-year forecast period (in this case, to 2014).

Infield's report *Offshore Construction Industry – A Long-Term View* forecasts (in Table 6-5) for the period 2005-2050 a worldwide total of 297 deepwater (500 meters or greater) production platforms, including 173 FPSOs, 53 TLPs, 43 Spars, and 28 FPSs. Of the 297 total forecasted for 2005-2050, 80 are expected to be located in Latin America, 78 in West Africa, 74 in North America, and 44 in Southeast Asia (as shown in Table 6-3 of the report). Together, these four regions account for 93 percent of the total.

The report provides dollar amounts for fabrication and construction costs (excluding engineering, design, transportation, installation, and commissioning) by region and year from 2000 to 2025 and in five-year intervals from 2025 to 2050. The costs include hulls as well as decks/topsides. The total expenditure in 2005 dollars for the 2005-2050 period is $72 billion. These costs, as well as expenditures back to 2000, are presented graphically in Figure 6-15, which is reproduced here as Figure 14.

Figure 14. Deepwater Facility Expenditures by Region



Source: Infield, 2005, *Offshore Construction Industry – A Long-Term View*.

MINERALS MANGAGEMENT SERVICE

MMS produces a long-term forecast every five years that identifies the number of oil/gas platforms in the GOM, including subsea units. The forecast is produced for four water depths as follows: (1) 200 to 800 meters; (2) greater than 800 meters to 1,600 meters; (3) greater than 1,600 meters to 2,400 meters; and (4) greater than 2,400 meters. The forecast is based on the projected oil field leases in each region of the GOM.

The 2002 MMS forecast is summarized in Table 14 for water depths greater than 200 meters and greater than 800 meters for low and high projections for five-year intervals. Although MMS produces an annual forecast of number of platforms by GOM region, the data have been compiled in the present analysis in five-year intervals to avoid disclosure. For the period 2002 to 2041, MMS projects that 322 platforms will be installed in water depths greater than 200 meters in its low forecast, and 458 platforms will be installed in its high forecast. For water depths greater than 800 meters, MMS projects a total of 222 and 351 platforms for the low and high forecasts, respectively.[1]

Table 14. Minerals Management Service GOM Platform Projections: 2002-2041

	>200m		>800 m	
Year	Low	High	Low	High
2002 - 2006	49	63	32	45
2007-2011	52	76	36	57
2012-2016	59	80	41	62
2017-2021	50	76	35	59
2022-2026	45	61	30	45
2027-2031	25	45	18	38
2032-2036	21	31	15	25
2037-2041	21	26	15	20
Total	322	458	222	351

Source: Minerals Management Service.

Table 15 shows GOM oil production units projected by MMS for the period 2000 to 2007 and actual for the years 2000 through 2007. For the period 2000 through 2004, actual units were 67, which exceeded the projected 48 units. A total of 30 of the 46 projected units from 2000 to 2004 were subsea units. For the entire forecast, subsea units are 70 percent of the total number of projected units (52/74 = 0.70).

Table 16 contains the MMS projections that have been modified by excluding the estimated number of subsea units based on their proportion of the total units in Table 15 (70 percent). The basis of the modification was to assume that one-third of the projected units would be platforms other than subsea. Table 16 also contains the Infield platform projections, which do not include subsea units.

[1] All references to MMS platforms include subsea units, unless otherwise specified.

Table 15. MMS Projected and Actual GOM Production Units

Year	Subsea Projected	Subsea Actual	TLP Projected	TLP Actual	Spar Projected	Spar Actual	Fixed Projected	Fixed Actual	FPU Projected	FPU Actual	Total Projected	Total Actual	Total ex Subsea Projected	Total ex Subsea Actual
2000	5	6	1	0	3	1	0	1	1	0	10	8	5	2
2001	4	11	0	3	2	0	0	0	0	0	6	14	2	3
2002	7	13	1	0	1	3	1	0	0	0	10	16	3	3
2003	7	8	1	1	1	2	0	0	1	1	10	12	3	4
2004	7	10	1	2	0	5	1	0	1	0	10	17	3	7
Subtotal	30	48	4	6	7	11	2	1	3	1	46	67	16	19
2005	8		0		1		0		0		9		1	
2006	7		0		1		1		1		10		3	
2007	7		1		0		0		1		9		2	
Total	52	48	5	6	9	11	3	1	5	1	74	67	22	19

Notes: The 2000 Fixed Actual is the Petronius Compliant Tower. The 2003 FPU Projected is the Na Kika, which is treated as one unit.

Sources: Projected installations are from MMS's May 2000 *GOM Deepwater Operations and Activities Environmental Assessment*. Actual installations are from MMS's October 2004 *GOM Oil Production Forecast: 2004-2013*.

Table 16. Minerals Management Service Modified Projections and Infield Projected GOM Platform Projections: 2002-2041

Year	MMS >200 m		MMS >800 m		Infield
	Low	High	Low	High	>500 m
2002 - 2006	15	19	10	14	18
2007-2011	16	23	11	17	14
2012-2016	18	24	12	19	10
2017-2021	15	23	11	18	10
2022-2026	14	18	9	14	12
2027-2031	8	14	5	11	9
2032-2036	6	9	5	8	3
2037-2041	6	9	5	6	4
Total	98	139	68	107	80
2012-2041	67	97	47	76	48

Notes: MMS projections reduced by 0.70 percent to estimate the number of platforms excluding subsea units.

Sources: G.E.C., Inc., and Infield Systems.

The MMS projections are shown for water depths greater than 200 meters and greater than 800 meters and extend out to the year 2041. The Infield projections are for water depths greater than 500 meters and extend out to the year 2050 but for purposes of comparison, Infields forecast was adjusted to 2041. As Table 16 shows, if the MMS projections are reduced by 0.70 percent to exclude subsea units, the remaining surface platforms for water depths greater than 800 meters are close to the Infield projections for the period 2002 through 2041. For the entire forecast (2002 through 2041), Infield projects 80 units compared to MMS's 68 units (excluding subsea) for its greater than 800 meters low forecast and 107 units (excluding subsea) for its greater than 800 meters high forecast. Although, Infield projected a total of 57 units for the period 2012 through 2050, for the period 2012 through 2041, which is applicable to with project conditions at the Port of Iberia, Infield projects 48 units compared to MMS's 47 units (excluding subsea) for its greater than 800 meters low forecast and 76 units (excluding subsea) for its greater than 800 meters high forecast.

The MMS forecast adjusted through exclusion of subsea units diverges substantially from the Infield projections only in the case of the greater than 800 meters high forecast. Moreover, as can be seen in Table 15, the total MMS units projected for 2000 through 2004 excluding subsea are very close to the actual units.

COMPETITIVE ENVIRONMENT

INTRODUCTION

Comparatively little is known about the specialty fabrication industry for the domestic offshore oil and gas industry. There are specialty fabrication yards in Texas, Louisiana, and Mississippi that custom build offshore structures for the oil and gas industry. This section of the report provides a description of the commercial prospects and practices of the domestic specialty fabrication sector in relation to deepwater offshore market issues, opportunities, competition, and capacity and relates these to foreign (international) competition. The discussion is based on opinions that were expressed in interviews and does not make judgments as to validity.

GEC conducted a series of personal interviews with the major fabricators and suppliers to develop greater insight into the competitive issues of the specialty fabricators for oil/gas offshore (deepwater) production platforms. Three of the Big Four (now Big Three) fabricators and the three fabricators (now two fabricators) at the Port of Iberia were interviewed, along with a major design/management firm and a major long-distance transport firm.[2] The interviews will be summarized here under the headings of: (1) markets; (2) growth trends; (2) competition and costs; and (4) topsides characteristics and production issues. A list of the persons interviewed is contained in Appendix C of the attached GEC report.

MARKETS

Although the fabrication of oil/gas offshore production equipment is worldwide, the major U.S. fabricators interviewed regard their primary market to be the Gulf of Mexico (GOM). The rest of the world is viewed as being highly restricted with respect to business opportunities. Brazil, for example, excludes foreign competition for prime contractor roles in the construction of deepwater platforms or major components (hulls and topsides).

Deepwater floating hulls are built predominantly in Asia. One fabricator provided an analysis showing that 75 percent of the deepwater hulls had been constructed in Asia. The U.S. is viewed as noncompetitive for hulls because of the substantial difference in shipyard labor costs, which are documented to be as much as 40 percent less than the U.S. For hulls, Finland was cited as having higher labor costs but greater efficiency for Spars. For semisubmersibles, Korea and Malaysia are the market leaders, and China will be in the future. Deepwater floating hulls are viewed as a commodity similar to the mass production of deep-draft marine vessels.

Although Asian shipyards dominate in the production of hulls (analogous to similar trends in maritime shipping), the topsides have the sophisticated technology, whose components are built in the U.S. The topsides have many differentiating components that are unique to the particular installation. Consequently, topsides, unlike hulls, are viewed as specialty goods designed to customer and project specifications. The topsides equipment is predominantly U.S. procured (not necessarily manufactured in the U.S., but procured from the U.S.). The U.S. procurement of the components favors local suppliers for the GOM market.

In the past, U.S. suppliers fabricated component kits that were shipped and assembled near final installation. The move to in-country work will not happen overnight. WA countries are starting with on-site engineering. The Koreans are said to be cornering the WA market (for example,

[2] Other discussions were held with Infield Systems, as well as exhibitors at the Deepwater Offshore Conference (December 1, 2004) and the Offshore Technology Conference (May 4, 2005).

Angola). The WA market was described by one of the Big Four (now Big Three) fabricators as a market for equipment and components related to topsides and not a market for the assembled topside unit.

Other parts of the world where there are significant deepwater reserves are also affected by local content restrictions that limit U.S. fabricator participation. For example, Brazil has allowed some European and U.S. components; but for the most part it is regarded as a closed market for non-Brazilian firms to act as prime fabricators. For the most part, West Africa, Mexico, the North Sea, Venezuela, and the Far East (Indonesia) are regarded as closed markets because of local content requirements.

Some of this can change. For example, marginal fields in the North Sea were found to be uneconomical for the large oil companies and are now being developed by independents. The smaller fields require more fixed and floating minimal structures. Most of the North Sea is mixed in terms of deep and shallow water platforms.

The development of overseas competition for GOM topsides is viewed as a possibility. There is a concern that the Koreans will aggressively seek out the particularly large topside GOM contracts. Interviewees stressed that the Korean shipyards (Daewoo, Hyundai, and Samsung) are very large industrial complexes with substantial labor force capabilities. These yards can be very competitive with small specialty fabricators as warranted by trends in the shipbuilding sector. It is anticipated that once the current boom in shipbuilding tapers off, the Koreans will aggressively pursue the deepwater market, not only in West Africa but also in the GOM.

Based on the fabricator interviews, other domestic competition for GOM topsides is also viewed as a possibility. Most shipyards (large scale fabricators) with access to deep water can technically produce hulls and/or topsides using conventional shipyard fabrication technology. The issue seems to be the extent to which shipyards are attracted to higher skill inputs (for example, bars, shapes, and piping) for specialty fabrication of deepwater topsides compared to mass production of marine vessel hulls characterized by plate steel. Presently, one domestic shipyard, Signal International (Signal), has indicated that it intends to expand in the oil/gas fabrication sector with respect to topsides. Signal notes that it already has oil/gas sector deepwater fabrication experience with regard to performing hull and topsides integration and related work at its Texas facilities.

Currently, Signal is making a hull for a deepwater platform at its Orange, Texas, yard, which is the first time in recent deepwater history (ten years) that a U.S. shipyard has supplied a deepwater hull for the GOM other than some smaller mini-TLP hulls.

Signal indicated that it had a strategic plan to enter the deepwater topsides market in 2005, focusing initially on the smaller units ranging from 4,000 to 6,000 fabricated tons as a way to grow into the business.[3] This plan was reportedly put on hold because of the large volume of hurricane-related repair work for jackup rigs (their conventional market) that has inundated their Texas yards (all of which have deepwater access).

[3] The expression "fabricated tons" refers to the fabrication contract weight rather than the installed weight of the fully equipped and outfitted topsides.

Oil production in the traditional shallow water sector of the GOM has declined. Future shallow water production will require new technologies for cost effective extraction. The small fabricators are finding their shallow water work is declining and will need to diversify. POI fabricators have conducted the bulk of their fabrication work in shallow water. The smaller fabricators are aggressively seeking new opportunities, many of which are outside the traditional GOM market. Gulf Island (one of the top tier fabricators) also has done a lot of shallow water work but has diversified to the point where 70 percent of its backlog is international business.

GROWTH

All of the firms interviewed expressed very limited forecasting capabilities, thus planning horizons are near term. Essentially, they do not do any very long-term forecasts of future demand for platforms because of the speculative nature of such exercises for commercial pursuits.[4] Long-term from a fabricator perspective would be 2008 to 2010. They usually look out only about 18 months beyond current exploratory drilling because that is the typical timeframe for the delivery of an offshore deepwater production platform.

From 1988 to 2002, there were financial peaks and valleys in the fabrication industry. There was a relative peak from the mid to late 1990s that extended to 2000. This peak was characterized by the highest employment, a healthy demand for fabrication for both small and large structures, and a strong demand for labor. Labor was typically working for 55 to 65 hours per week (full employment). This period is regarded as the peak of the traditional fabrication modules for fixed platforms and topsides. During the late 1990s, fabricators were in the early stages of deepwater development.

One large fabricator expressed the opinion that U.S. deepwater oil/gas production could peak as early as 2010. The deepest wells will be in 8,000 to 10,000 feet of water. The GOM will decline in floaters and will increase in tiebacks that reduce the need for floaters.[5] This Big Four (now Big Three) fabricator views the crest in deepwater platform development occurring by 2010, with a possible short-term lag for final deliveries. There will be sufficient topsides capacity during this final crest of development in the GOM, since Gulf Island and McDermott can produce 10,000-ton topsides. Most of the topsides are envisioned as being in the 10,000-ton range by this fabricator. Beyond 2010, demand for topsides will decrease.[6] More independent producers will take over marginal areas as the majors pull back, and the independents will act in

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[4] Exceptions undoubtedly exist. For example, one fabricator indicated that they had made a substantial capital investment of $2.0 million on a bulkhead in 1998, expecting a two-fold growth of the market for fabrication and other activities; but this did not happen.

[5] Tiebacks refer to using pipelines in relation to existing platforms rather than developing new platforms. A widely cited example is the cancellation of Thunder Horse II because tiebacks enabled these fields to be served by existing infrastructure.

[6] Infield Systems' very long term forecast for GOM platforms suggests that another mini-crest will occur about 2015. After that the long-term demand for deepwater oil/gas platforms in the GOM will be one to two units a year out to 2030, further declining thereafter to less than one unit per year until 2050.

tandem with the majors. The 2010 peak will be the last of the big waves for the GOM and domestic fabrication of topsides.[7]

PRODUCTION COSTS

Once the labor is in place the large fabricators regard themselves as fixed cost enterprises. Basically, labor once employed is considered an overhead issue in terms of keeping people billable. Typical overhead factors used to markup direct labor to reflect all other costs are said to be 2.5 for fabricators with technical design capabilities and 2.1 to 2.2 for fabricators without technical design capabilities. Breakeven is regarded to be about 75 percent of capacity for large fabricators with technical design capabilities. For fabricators without the overhead associated with design capabilities, breakeven is regarded to be closer to 50 percent of capacity.

Margins in the industry had been (gross) about 20 to 22 percent available to cover general and administrative expenses of 10 to 12 percent. After-tax profit margins expressed as a percentage of revenue are said to be between 3 to 4 percent at best.

Typically, platform fabrication costs are about 50 percent labor and 50 percent steel. The weakening of the U.S. dollar in foreign markets has made the U.S. more competitive. Steel mills were comparatively cheap in Europe until China emerged. In the past, steel was procured overseas when the U.S. dollar was strong. For topsides, one of the advantages is that fabricators can buy from vendors in the Gulf and Houston. There is also local technical support that enables fabricators to guarantee delivery dates for topsides.

A hull can be built anywhere because the construction is simple. Hull fabrication is regarded to be a welding (shipyard) issue. The cost of the (mostly) plate steel used in hulls is between $2,000 and $3,000 per ton. Charges to move hulls from the Far East to the GOM range from $2.0 to $5.0 million, depending on the time available. For example, it cost between $5.0 and $6.0 million to bring the Na Kika to the GOM from Korea.

For topsides, the cost is about $4,000 to $5,000 per ton for structural steel. Overall, the topsides is a combination of structural steel and piping. The piping is about $14,000 per ton because of the welding and fabrication. The exact mix of structural steel and piping varies with the blending capabilities, depending on the production mix of oil, gas, and water. These are often among the topsides decisions that are made last, depending on the reserves and the feasibility for oil and gas.

It takes about 18 months to build a complete topsides fully outfitted with all equipment. The topsides is about 95 percent fully specified when it goes to bid. The piping is normally finalized after the second month of construction. There is some lag time to order specialty equipment such as compressors (18 months) and generators (two years).

Gulf Island estimates that it has about 2.0 million production hours per year and could expand to 2.5 million. Employment at 2.5 million hours per year would be about 1,000 to 1,100 jobs.

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[7] The 2010 projection by this fabricator was the longest term perspective that was found among the interviewed firms.

McDermott can generate 2.5 million hours per year and could go to 3.0 million hours.[8] Kiewit has about the same capability as Gulf Island. Technip has about 400 to 500 employees. The 2000s have been relatively stable, with a lot more international work.

There are different estimates of the Big Four fabricators (now Big Three) production hour capabilities because of assumptions about the mix of labor and subcontractors. Overall, the Big Four fabricators' (now big Three) concur that the total annual production capabilities are in the range of eight to 10 million hours. The three large fabricators other than McDermott are of similar size from a production capability perspective (annual million labor hours). Estimates of the current utilization rate of the Big Four (now Big Three) fabricators' production capabilities range from two to five million labor hours.

For the eight million total labor hours of estimated annual capacity, each of the Big Four (now Big Three) is viewed as being similar in size and market share, particularly since the decline of McDermott. The fabrication market peaked at 10 to 11 million annual labor hours when BP contracted with McDermott for four big floating systems. There was a scramble for welders during the peak, which was driven by the four BP jobs that tied up the McDermott yard under an exclusive contract and forced its other customers to go to other yards. The big boom was followed by a big bust, and the market has declined substantially. The situation with respect to the level of fabrication work in the early part of this decade will not return.

Labor direct costs (hourly wage rates) for skilled fabrication work are very similar in Texas and Louisiana. Labor costs are about $2.00 per hour less in South Texas than Louisiana ($16.00 per hour in South Texas and $18.00 per hour in Louisiana). However, there are some issues concerning labor quality and productivity in the South Texas market. Fabrication labor is said to be about $18 per hour at McDermott as the high cost producer among the Big Four (now Big Three). Fabrication labor at POI ranges from $15.50 to $16.00 per hour. There is some speculation that fabrication labor rates at POI are slightly higher than South Texas. McDermott has a unionized work force, Gulf Island reportedly pays higher labor rates to stay non-union, and most fabricators are non-union.

TOPSIDES CHARACTERISTICS AND PRODUCTION ISSUES

There is debate over modularization and sizes of the topsides. The Thunder Horse topsides was said to have been built in three modules about 5,000 to 6,000 tons each, with the largest piece about 6,500 tons. The topsides for the Atlantis project were 15,000 tons. The topsides for the Holstein project were in three modules that totaled about 17,000 tons. The largest piece of the Holstein topsides was 8,500 tons. Holstein is the largest Spar in the GOM. The Mad Dog project, the second largest Spar, had a single piece topsides of 7,500 to 8,000 tons. Both of these Spars required offshore installation.

Initial interviews revealed that one Big Four (now Big Three) fabricator envisioned a movement away from Spars in the GOM and toward more semisubmersibles. The big trend would be toward platforms such as semisubmersibles that can be fully integrated dockside to avoid the

[8] McDermott production peaked in April 2004 with 1,600 yard employees and yard supervisors.

risks and high costs of at-sea installation.[9] However, subsequent market share interviews do not validate or support this view. It appears that Spars are expected to continue to be the predominant hull type for deepwater GOM for the foreseeable future. The recent round of market share interviews suggests that topsides will be smaller than previously, particularly for some of the very big footprint platforms. At least one major oil producer reportedly announced that it would shift back to smaller platforms, moving away from the very large units that it publicized in the early 2000 decade. It was noted, “The platforms will be 6,000 to 7,000 tons topsides. He sees that 75 percent (between 2/3 and ¾ of the topsides) will be in the 5,000, 6,000 and 7,000 ton range and the rest will be much larger”

In addition, among the Big Four (now Big Three) fabricators, the deepwater production platform market is envisioned as moving toward total integration at dockside for FPSs (semisubmersible and TLPs). The heavy lifts would be done with shoreside cranes rather than floating derrick barges ($10 million to mobilize and $10 million to get the barge to the GOM). Integration at dockside is expected to increase, replacing heaving lift derrick barges costing upward of $0.5 million per day. Dockside is the trend for more production (time and schedule) and cost reduction. The trend for deepwater oil and gas platforms is to do all integration at the dockside. The time for final installation dockside is from 35 to 45 days. Dockside installation means smaller lift GOM vessels for less than 7,000 tons. Mobilization and demobilization expenses for heavy lift derrick barges are large variables. For topsides and hulls, at-sea installation is estimated to be $20 million for equipment mobilization and demobilization. The installation is about $1.5 million per day multiplied by 30 days plus insurance and is also complicated by weather conditions. Except for Spars, which cannot be integrated at dockside, the trend is to integrate all platforms at dockside. Spars hulls have to be flooded to be set upright, after which the topsides are set in place. Dockside capabilities for handling FPSOs are limited.

Floatover technology for at-sea installation is viewed primarily applicable for WA and not for the GOM. The GOM sea states (calmness) are not regarded as particularly attractive for floatover installations of topsides. As a result, at-sea installation in the GOM primarily involves heavy lift derrick barges that are expensive and difficult to schedule.

For topsides and bidding, the big issue is the size of the barge in relation to the channel. The barge for moving a topside out for at-sea installation or installation at another port is very specific for the particular topside with regard to its footprint. The first question posed by the fabricator considering a topsides bid is “What vessel is going to be used to transport the fabricated piece out?” The size of the vessel sets the bid stage in terms of what bidders are eligible to participate. The leeway for the vessel determines which of the Big Four (now Big Three) fabricators can participate.

FUTURE WITHOUT PROJECT CONDITIONS

As production in the shallow water areas of the world decline as indicated by most industry projections, fewer and fewer contracts are let for topsides, such as those produced at the Port of Iberia. Competition among the Gulf coast fabrication ports will be intense. As can be seen from

[9] Spars have to be towed to installation and then flooded for sinking prior to topsides installation.

Table 17 below, deepwater production has surpassed shallow production since early 2000's. This trend is expected to continue.

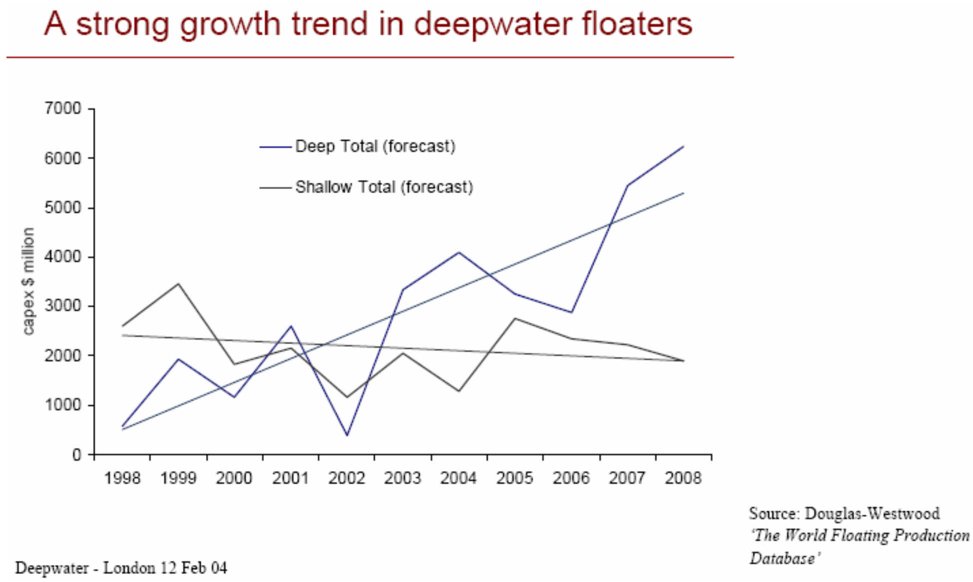
According to various studies, both shallow water oil exploration and shallow water floater production are in steady decline. A recent report by the Minerals Management Service (*Deepwater Gulf of Mexico: America's Expanding Frontier*, OCS Report, 2002-021) details average oil and gas production in the Gulf of Mexico. As displayed in Table 17, from 1990 – 2001 shallow water oil production has flattened or decreased while deepwater oil production has exploded from 33 million barrels of oil per day in 1990 to 930 million barrels of oil per day in 2001. Clearly the focus for future oil exploration and production has shifted to the deeper waters of the Gulf of Mexico. A study by Douglas-Westwood (*The World Floating Production Database*) further explores this trend. Figure 15 shows how capital expenditures for shallow water floaters are predicted to steadily decline from nearly $3 billion in 2005 to approximately $2 billion in 2008. During this same time period, deepwater floater capital expenditure is expected to jump from slightly over $3 billion to more than $6 billion. Thus, although overall spending in oil exploration and production will continue to increase as the world demand for oil grows, the industry is deliberately moving to focus its future resources on deepwater efforts.

Table 17: Average Annual Oil and Gas Production in the GOM-Deepwater and Shallow Water

Year	Oil (MBOPD)		Gas (BCFPD)	
	Shallow-water	Deepwater	Shallow-water	Deepwater
1990	719	33	13.4	0.1
1991	745	63	12.7	0.2
1992	733	102	12.5	0.2
1993	745	101	12.4	0.3
1994	746	115	12.8	0.4
1995	794	151	12.6	0.5
1996	813	198	13.2	0.8
1997	830	297	13.1	1.0
1998	781	436	12.3	1.5
1999	741	617	11.5	2.3
2000	690	743	10.8	2.7
2001	620	930	10.7	3.2

Source: *Deepwater Gulf of Mexico: America's Expanding Frontier*. Minerals Management Service, OCS Report, 2002-021

Figure 15: Strong Growth Trend in Deepwater Floaters



These traits that are indicative of the oil exploration and production industry are also reflective of the demand for production activities at the Port of Iberia. Currently, at the Port, there is demand for 5000-ton or less topside packages (products for the shallow water market). In fact, interviews with Port of Iberia industry representatives have revealed that approximately $64 million represents the annual value of shallow water fabrication work. However, as discussed in the study by Douglas-Westwood (*The World Floating Production Database*) this demand is limited and is expected to decline. *The basic assumption of this analysis is that POI will not be able to participate in any of the projected deepwater offshore topsides fabrication projects as a prime contractor under the without project conditions.*

FUTURE WITH PROJECT CONDITIONS

WITH PROJECT ALTERNATIVES

Historically the major oil companies have not considered bids for deepwater fabrication contracts from fabricators at ports with insufficient channel depth. Therefore in determining with-project benefits alternative channel depths of 16 feet, 18 feet and 20 feet, all having a width of 150 feet, were analyzed. Depths greater than 20 feet were not considered because the local sponsor of this project has restricted their participation to channel depths of 20 feet or less.

MARKET SHARE SCENARIOS

Market Share Based On Capacity

Infield Systems (Infield) has provided a long-term worldwide forecast of the number, type, and region of deepwater oil/gas platforms to be installed annually up to 2025 and thereafter in five-year periods up to year 2050.[10] The U.S. market share issues that need to be determined with respect to the projected world market for deepwater platforms are the U.S. fabricator share of topsides under without project conditions and the Port of Iberia (POI) share of the total U.S. topsides market share under with project conditions. As mentioned above, the basic assumption of this analysis is that POI will not be able to participate in any of the projected deepwater offshore topsides fabrication projects as a prime contractor under the without project conditions.

Collectively, three regions Gulf of Mexico (GOM), West Africa (WA), and Latin America (LA) constitute the “golden triangle” of the majority of deepwater offshore reserves and projected activity. Infield forecasts that nearly 80 percent of the total deepwater oil/gas platforms that will be installed between 2010 and 2050 will be in the “golden triangle.” Infield projections for the period 2010 to 2050 reflect a nearly equal market share of platforms in the three regions of the “golden triangle.” The U.S. and POI market shares of deepwater topsides were developed separately for the U.S. Gulf Of Mexico (GOM). WA and LA regions were excluded because these regions are primarily closed to U.S. fabricators who are effectively prohibited from competing in this market because of local content restrictions.

[10] The Infield world regions include Australasia, East Asia, Eastern Europe, India, Latin America, Middle East, North Africa, North America, NWECS, South & East Africa, South East Asia, Southern Europe, and West Africa.

The U.S. fabricator market share of production of deepwater topsides in the GOM has been nearly 100 percent.[11] Field interviews suggest that this will continue to be the case. Using the GOM as a 100 percent U.S. market share of fabrication of future topsides, the issue is the estimated POI market share of the U.S. under with project conditions. If the POI fabricators are technically eligible to bid under with project conditions, it would appear reasonable to assume that they would share the deepwater topsides market in some relationship to the share of capacity that they would bring to the U.S. market, other things being equal.[12]

Table 18 identifies the estimated average annual and practical maximum number of production hours that U.S. fabricators can supply based on field interviews. The average annual and practical maximum number of total production hours for the "Big Four (Three)" fabricators are 8.0 and 9.9 million, respectively.[13] For the POI fabricators, the estimated average and practical maximum annual number of total production hours is estimated to be 2.9 and 3.2 million, respectively.[14]

As is shown in Table 18, for the average and maximum annual production hours, the POI fabricators' market share of total U.S. hours would be 27 and 24 percent, respectively. For this analysis, it is assumed that POI fabricators will participate in GOM deepwater topsides construction equal to their share of total U.S. fabricator capacity, expressed in annual production hours. This scenario reflects an assumption of sustained excess capacity for topside fabrication. The comparatively small spread of the POI share between average and practical maximum number of annual production hours suggests that 25 percent would be a reasonable estimate of the POI share of total U.S. fabricator hours for forecasted GOM deepwater topsides.

Table 18. U.S. and POI Fabricator Estimated Annual Hours of Production

Fabricator	Hours 1	Hours 2	Hr 1 Share	Hr 2 Share	Hr 1 Share	Hr 2 Share
Gulf Island	3.5	4.4	44%	44%	32%	34%
McDermott	2.5	3	31%	30%	23%	23%
Kiewit	2	2.5	25%	25%	18%	19%
Subtotal	8	9.9	100%	100%	73%	**76%**
Dynamic	1.7	2	59%	63%	16%	15%
Omega	1.2	1.2	41%	38%	11%	9%
Subtotal	2.9	3.2	100%	100%	27%	**24%**
Total	10.9	13.1			100%	100%

Note: Production hours expressed in millions (000,000).

Hours 1 = Avg Annual Production Hrs; Hours2 = Max Practical Annual Hrs of Production

[11] With two exceptions, all deepwater topsides have been fabricated by U.S. firms.

[12] The cost structures for the POI fabricators are regarded as similar and competitive with the cost structures of the Big Four (Three) fabricators. "Least total cost" is generally not regarded as an applicable criterion to award fabrication work when there are other considerations among fabricators with similar cost structures.

[13] The Big Four (Three) fabricators are J. Ray McDermott (Morgan City, Louisiana), Gulf Island Fabrication (Houma, Louisiana), and Kiewit Offshore (Ingleside, Texas).

[14] POI fabricators are Dynamic Industries, and Omega Natchiq.

Additional Market Share Scenarios

Apart from the development of market share based on capacity of bidders or yards, the scenario analyses should reflect type of fabrication contracts, types of hulls with regard to dockside integration of topsides or at sea installation, and staging of awards of future topsides orders at POI. Each will be discussed below.

1. **Foreign and Domestic Competition** will reflect the extent to which there will be increased competition that would affect U.S. fabricator market share among the existing Big 4 yards/Big 3 firms and Mid 3 yards and Mid 2 firms at POI. Interviews confirmed that competition from Korea is a distinct threat, particularly for very large topsides and for EPC contracts. Another U.S. shipyard is making a deepwater hull and has a strategic plan to begin making small deepwater topsides to expand into this sector. Water depth for their yard is not a problem for large deepwater topsides.

2. **Type of contracts** will affect the ability of the POI fabricators to participate in bidding for topsides. Engineer, Procure and Construct (EPC) or Engineer, Procure, Install and Commission (EPIC) contracts will tend to exclude smaller firms and firms such as GIF lacking engineering capabilities (other than through a subcontractor). These are large contracts inclusive of financial capability that exceed smaller firms such as GIF and POI. Although it is possible that an exclusive type of contract as EPC or EPIC represents might allow for subcontracting to a smaller fabricator, the extent of continuing excess capacity in the fabrication sector suggests that this is not likely to occur (as when McDermott subcontracted topsides for BP to GIF in the early 2000s because of capacity constraints at their Amelia, Louisiana, yard with four big platforms underway). The all-inclusive contracts wherein the oil company or its engineering representative acts as a general contractor would allow POI firms to participate as fabricators of topsides independent of hulls, integration, etc.

3. **Types of hulls** with regard to location of integration will also affect POI's market share. Hulls and topsides that are integrated at port will most likely be done at Texas yards now controlled by GIF and Kiewit. These firms are expected to be very competitive, bidding on complete packages of topsides and hull integration at their deepwater facilities. Conversely, Spar hulls require at-sea installation, effectively meaning that the topsides can be made separately from the hull and installed by a marine contractor that is not related to one of the fabricators (unless a subsidiary of McDermott is used for small lifts at sea). It is expected that the POI fabricators will have the best success going after topsides for Spars, which have no shore-side integration issues and competition from other fabricators with integration capabilities.

4. **Staging of topsides orders** refers to the market share of future topsides controlled by independent oil companies compared to majors and the time phasing of consideration of POI fabricators for large deepwater topsides. It is believed that the use of POI would be initially determined by independents that are perceived to be less risk averse and have stronger ties with the existing POI firms. The majors are perceived as less flexible and more rigorous with regard to fabricator capabilities, including staffing, and

selection. Effectively, the staging would reflect two time series of topsides from the control of independents and majors.

In summary, the additional scenarios will reflect increased (domestic and/or foreign) competition, type of contracts, types of hulls with regard to integration/installation, and staging of orders with regard to independents and majors.

Scenario Formulation

The scenario analyses were performed as a series of sequential development of market share determinants for the POI fabricators under with project conditions. As discussed previously, the market share of the two POI firms is computed to be 25 percent of total annual labor hours for the Big 3 and Mid 2. The additional market share scenarios were then applied sequentially to the POI market share. A brief description of the market share scenario sequences follows.

The entire GOM long-term deepwater topsides market projected between 2012 and 2050 is the starting point of the analysis. For the period 2012 through 2050, there are a total of 57 deepwater platforms projected for the GOM.[15] Eighty percent of these hulls are TLPs or Spars, which characteristically predominate the GOM. Less than 20 percent of the hulls are larger semisubmersible or FPSOs. Using the same forecast period and hulls, the initial POI market share was developed for the increased foreign/domestic competition scenario. It was assumed that increased foreign and domestic competition for topsides would result in a 10 percent reduction in Spar topsides and a 20 percent reduction in other topsides (TLPs, FPSs, and FPSOs). The lower percentage of increased competition for the topsides for Spar hulls reflects greater expertise of GOM fabricators for these topsides, necessity of at sea installation, and greater foreign interests in larger topsides more closely associated with shipyard fabrication (FPSOs and semisubmersibles).

The increased competition scenario has two branches: "yes," signifying a reduction in the GOM total topsides market available to POI and Big 3 firms under with project conditions because of increased competition; and "no," signifying no reduction in the GOM total topsides market available to POI and Big 3 firms under with project conditions because of no increased competition.

The all inclusive contracts that allow for smaller fabricator firms to bid for pieces of the platform independently (such as topsides) under an oil/gas firm contract manager were assumed to constitute 80 percent of the future projects. Accordingly, 20 percent of the future projections were assumed to be Engineer, Procure and Construct (EPC) and not available to smaller fabricators (other than subcontractors) for topsides.[16] The use of EPC contracts has fluctuated in the GOM. It is believed that a 20 percent EPC acquisition process by oil/gas companies for deepwater projects is reasonably conservative.

[15] The analysis omits reference to other markets such as West Africa because of the paucity of U.S. fabricator topsides projected for that market.
[16] Given the existing and anticipated excess specialty oil/gas fabrication at the Big 3 firms and Big 4 yards, it is doubtful that subcontracting would occur to POI Mid 2 firms under an EPC contract.

The platform integration scenario applies to all topsides other than Spar topsides, which must be integrated at sea. The other topsides are integrated with hulls at dockside. Integrated fabricators with deepwater capabilities (Gulf Island through Gulf Marine and Kiewit) are regarded as having a competitive advantage in securing topsides contracts in conjunction with integration capabilities and contracts. It is assumed that 50 percent of the topsides other than Spars would not be available to POI under integration competitive advantages. This scenario does not apply to Spars, which represent the largest market for GOM (nearly 60 percent of total project topsides during the period 2012 through 2050).

The last scenario is the staging scenario which assumes that major oil companies would not award POI contracts for at least five years after the inception of the with project conditions. Rather, the independents would award contracts to eligible POI fabricators and the majors would assess performance accordingly. The staging scenario was applied to topsides for Spar hulls, which were assumed to be evenly distributed between majors and independents during the forecast.

Number of Topsides

Table 19 shows the number of deepwater topsides for the GOM by project depth and for the POI market share scenarios. A total of 57 topsides are projected for GOM deepwater installations for the period 2012 through 2050.[17] The market share for the GOM deepwater topsides is stipulated to be 100 percent, ignoring foreign or other domestic competition (consistent with the July 2005 Draft Report). The increased competition (domestic and foreign) “yes” scenario results in a loss of eight topsides, leaving a market of 49 deepwater topsides projected for the GOM, which is 86 percent of the total during the period 2012 and 2050.

[17] The Infield projections do not explicitly reflect the extent to which deepwater platforms would be reused by relocation. It is assumed that the Infield projections reflect new buildings and not new installations that would be covered in part by relocating existing topsides, particularly FPS, TLP and FPSO units that are relatively portable compared to Spars.

Table 19. Port of Iberia Deepwater Topsides Fabrication Units for Market Share Scenarios for Gulf of Mexico: 2012 to 2050

Staging									5 yrs	5 yrs
Integration							50%	50%	50%	50%
Contracts					80%	80%	80%	80%	80%	80%
Competition	no	yes	no	yes	no	yes	no	yes	no	yes
Firms	ALL	ALL	2	2	2	2	2	2	2	2
16 foot	46	40.20	11.50	10.05	9.20	8.04	8.00	7.08	7.30	6.45
18 foot	6	4.80	1.50	1.20	1.20	0.96	0.60	0.48	0.60	0.48
20 foot	5	4.00	1.25	1.00	1.00	0.80	0.50	0.40	0.50	0.40
Total	57	49.00	14.25	12.25	11.40	9.80	9.10	7.96	8.40	7.33
Market Share										
16 foot	100%	87.4%	25.0%	21.8%	20.0%	17.5%	17.4%	15.4%	15.9%	14.0%
18 foot	100%	80.0%	25.0%	20.0%	20.0%	16.0%	10.0%	8.0%	10.0%	8.0%
20 foot	100%	80.0%	25.0%	20.0%	20.0%	16.0%	10.0%	8.0%	10.0%	8.0%
Total	100%	86.0%	25.0%	21.5%	20.0%	17.2%	16.0%	14.0%	14.7%	12.9%
Share Change										
16 foot		0.126		0.032	0.050	0.044	0.026	0.021	0.015	0.014
18 foot		0.200		0.050	0.050	0.040	0.100	0.080	0.000	0.000
20 foot		0.200		0.050	0.050	0.040	0.100	0.080	0.000	0.000
Total		0.140		0.035	0.050	0.043	0.040	0.032	0.012	0.011

Notes:Numbers of topsides under market share scenarios expressed in fractional units without rounding.
"Firms" refers to all GOM deepwater topsides fabricators at POI.
"Competition" refers to "yes" and "no" scenarios of increased foreign and domestic competition for deepwater topsides from other fabricators, exclusive of existing suppliers.
"Contracts" refers to percentage of awards for deepwater platforms constructed under all-inclusive bidding (not excluding small firms lacking EPC capabilities).
"Integration" refers to exclusion of a portion of non-SPAR topsides - 50% - (FPS, FPSO and TLP) from non-integrated firms lacking deepwater capabilities of the Texas yards for GIF and Kiewit.
"Staging" refers to major oil companies not awarding deepwater contracts at POI until after first five years of the with project conditions.
"Market Share" is for ALL GOM fabricators followed by 1 or 2 fabricators at POI for successive scenarios of "competition," "contracts," "integration," "staging," and "performance."
"Share Change" is the percentage points differences between successive scenarios for the same preceding scenarios (for example, 2 firms at POI for foreign competition have 4.4 less percentage share under "contracts" scenario compared to "competition" scenario).

Source: G.E.C., Inc.

The initial maximum market share for POI would be for the market share scenario of no increased competition. This is shown to be 14.25 deepwater topsides in Table 19 and 25 percent market share of the entire GOM.[18] Increased competition results in a reduced POI total market share for all deepwater topsides of 21.5 percent (or 12.25 units). The presence of exclusive contracts for 20 percent of the GOM deepwater platform installations results in a reduction of POI total market share to 20.0 percent under no increased competition (11.40 topsides) and 17.2 percent for increased competition (9.80 topsides). The inclusion of competitive impacts of integration capabilities for deepwater topsides other than Spars following the contracts scenario further reduces POI market share to 16.0 percent (9.10 topsides) and 14.0 percent (7.96 topsides) for no increased competition and increased competition, respectively. Finally, the staging market share scenario following integration scenario applies to awards of deepwater topsides contracts by major oil companies for Spars for five years after the inception of the project (2012). The staging market share scenario further reduces the total POI market share to 14.7 percent (8.40 topsides) and 12.9 percent (7.33 topsides) for no increased competition and increased competition, respectively.

Table 19 indicates the points of market share change between successive scenarios. For example, the increased competition scenario reduces the POI total market share from 25.0 percent to 21.5 percent, or 0.035 percentage points. The 20 percent EPC (exclusionary) contracts scenario reduces the POI total market share 0.050 and 0.043 percentage points for no increased competition and increased competition, respectively. The 50 percent exclusion scenario of topsides for dockside hull integrations (other than Spars) reduces the POI total market share by 0.040 and 0.032 percentage points for no increased competition and increased competition, respectively. The staging scenario reduces the total POI market share by the small amount of 0.012 and 0.011 percentage points for no increased competition and increased competition, respectively.

As can be seen in Table 19, the biggest impacts on POI total market share (all deepwater topsides) in terms of reduction of percentage points of total market share (all topsides) are 20 percent EPC (exclusive) contracts, 50 percent loss of topsides other than Spars due to Gulf Island and Kiewit integration capabilities, and increased competition. The staging scenario has decidedly less individual and cumulative effects on market share reduction from the perspective of percentage point changes.

TOPSIDE WEIGHT AND CHANNEL DEPTH

Table 20 below indicates the four types of topsides and their associated average fabricated weights. Fabricated weight is the tons of the topsides from the perspective of the fabricator. It includes the steel components of the main structures (decks) and piping, but does not include the weight of installed equipment such as pumps, living quarters, helipads, etc. Industry sources revealed that the typical fabricated weight of topsides for the different hulls was as follows: TLPs - 4,000 tons; Spars - 5,500 to 6,500 tons; FPSOs - 8,000 tons; and FPSs - 10,000 tons. There is variability among these weights, somewhat in proportion to the different sizes, with FPSs having the largest scatter of weights and TLPs and Spars having smaller scatters of weights. The fabricated weights that we used are regarded as representative of the typical expected fabricated weights of deepwater GOM topsides.

[18] 57 topsides.

The shipping weight adds another range of variability to the overall weight of the topsides. The weights of the installed equipment will vary with the production capabilities, etc. Typical equipment weight will add up to a maximum of 50 percent of the fabricator weight but sometimes less. For Table 20, it was assumed that the shipping weight would be 1.5 times the fabricated weight. This assumption results in a Spar shipping weight of 9,000 tons, which is the maximum that can be lifted at sea for a single lift. Spar topsides exceeding approximately 9,000 tons will require modules.[19]

The maximum shipping weights based on 1.5 times the typical fabrication weights are 6,000 tons for a TLP, 9,000 tons for a Spar (single lift ceiling), 12,000 tons for an FPSO, and 15,000 tons for an FPS. Pieces larger and smaller will occur, although the tendency at least for Spars is a distinct preference for a single lift and a maximum shipping weight that does not exceed 9,000 tons.

Topsides are typically not bulky, but have considerable size, length, width, and height. Because of height, maximum barge ballasting is preferred to reduce the center of gravity. Table 1 computes shipping drafts without ballasting based on barge immersion factors of 1,000 tons per foot and 1,250 tons per foot. The 1,000 tons per foot is regarded as a very low threshold for shipping draft immersion. The 1,250 tons per foot is regarded as a more typical threshold for shipping draft immersion. As shown in Table 20, for the very low shipping draft immersion (Draft 1 - 1,000 tons per foot), TLP and Spar topsides would need 10.0 and 13.0 feet of shipping draft (exclusive of ballasting). For the more typical shipping draft immersion (Draft 2 – 1,250 tons per foot), TLP and Spar topsides would need 8.8 and 11.2 feet of shipping draft (exclusive of ballasting).

Industry sources suggest that the barge will be ballasted to the maximum depth to reduce the high center of gravity of the topsides.[20] Allowing one foot for underkeel clearance, the Draft 2 Ballast tons would include 6.2 and 3.8 feet for the TLP and Spar topsides (requiring a 16 foot channel), 3.4 feet for the FPSO topsides (requiring an 18 foot channel), and 3.0 feet for the FPS topsides (requiring a 20 foot channel). For a 15-foot sailing draft, the barge ballast tons would reflect 41 percent of total draft for TLP topsides and 25 percent of total draft for Spar topsides. For the FPSO and FPS topsides, the ballast tons would reflect 20 and 16 percent of total draft, respectively.[21]

A 16 foot channel at POI, exclusive of tide, would be sufficient for the smaller topsides with shipment weights less than 9,000 tons. As a practical matter, the shipment and installed weight of most Spars will not exceed 9,000 tons, but will be less by a margin of comfort for the lift capabilities of the installer. The 9,000-ton shipment weight Spar was used as the maximum size for a single lift installation (at sea) for this kind of topsides.

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[19] The maximum GOM lift capacity is 9,000 short tons for the Hermod crane vessel operated by Heerema Marine Contractors.

[20] A typical Spar topsides with three decks will be over 100 feet high.

[21] The larger topsides would likely be moved on a 25-foot draft barge, which would allow for more ballast relative to total draft outside of the access channel.

Table 20. Topsides Weights for Fabrication, Shipment, and Barge Drafts

Topsides	Fab. Weight Tons	Ship. Weight Tons	Draft 1 Feet	Draft 2 Feet	Channel Depth (ft.)	Draft 2 Ballast (ft.)
FPS	10,000	15,000	19.0	16.0	20.0	3.0
FPSO	8,000	12,000	16.0	13.6	18.0	3.4
SPAR	6,000	9,000	13.0	11.2	16.0	3.8
TLP	4,000	6,000	10.0	8.8	16.0	6.2

Notes: Fab. Weight Tons is the average fabricated structural weight (steel) from which the value of the contract is derived ($8,000 per ton).
Ship. Weight Tons is the average shipping weight of the completed topsides, reflecting installation of equipment.
Draft 1 is the shipping weight barge immersion based on one foot per 1,000 tons and four feet barge light weight draft.
Draft 2 is the shipping weight barge immersion based on one foot per 1,250 tons and four feet barge light weight draft.
Draft 2 Ballast is the ballast for a 20 foot channel (FPS), 18 foot channel (FPSO), and 16 foot channel (Spar and TLP) with one foot of underkeel clearances.
Channel Depth (ft.) all channel depths reflect MLW and do not include allowances for diurnal tides which are estimated to have a normal range of 1.22 feet at POI.
A smaller channel for TLP topsides is not explicitly considered due to the comparatively low volume of these topsides under the market share scenarios.

Source: G.E.C., Inc.

Topside weights on a systematic basis are available only in terms of installed topsides. Installed topside weights (load-out weights) reflect the weights of topsides as they leave the fabrication yards because they include additional components such as heliports and living quarters. As opposed to installed weight, fabricator weight does not include these additional components. In this analysis, the topside fabricator contract weights were assumed to be an average of 6,000, 8,000 and 10,000 tons for SPAR, FPSO and FPS, respectively. The corresponding installed weights were assumed to be 9,000, 12,000 and 15,000 tons. The associated channel depth required to safely move topsides with installed weights of 9000, 12,000 and 15,000 tons were identified to be 16, 18 and 20 feet respectively. This information was obtained through industry sources.

Additional efforts were made to establish the weight-draft relationship. A separate industry source provided the information contained in Table 21. Table 21 shows a generalized relationship between the weight of topsides and the total draft of the barge used to move the structure to its final destination. Also shown is the channel depth required to accommodate a given weight class. Topsides weights are arranged in size "categories". The industry preferred barge use to move structures weighting in excess of 5,000 tons from port to locations in the deep waters of the Gulf is 400 feet long, 100 feet wide and from the deck to the bottom of the hull measures 25 feet. Barges of this type have a maximum draft of about 21 feet. This barge is incorporated into the analysis of Table 20.

Total draft requirement was computed by adding barge empty draft (“barge draft” in Table 21) and a trim and ballast estimate to the topside draft. Trim and ballast requirement is an additional emersion requirement for stability and safety reasons. The greater the emersion the lower the barge rides in the water, the more stable it will be. Table 21 shows that when the load exceeds 12,000 tons the ballast requirements decline. This is due to the fact that ballast weight is replaced by the weight of the load. One additional consideration, underway underkeel clearance, is necessary to determine the required channel depth for each weight class. One foot is generally used as the minimum requirement.

In another attempt to define the weight-draft relationship, Table 22 was generated. Table 22 assumes the same barge draft, ballast and underkeel in Table 21. The immersion due to topside weight was estimated using the Barge Displacement Calculator published by McDonough Marine. See Figure 16. Immersion, expressed as short tons per foot assuming the industry preferred barge (400 ft x 100 ft), was determined to be 1,250 tons per foot using the Barge Displacement Calculator. This corresponds to the immersion factors provided by the second referenced industry source (Table 21).

It must be emphasized that the loading relationships described in Table 21 and Table 22 are generalized approximations. The variability in physical configuration for topsides of a given weight class along with variability in operations that exist at the time of transit make specifications of a precise load to draft relationship impossible. The oil/gas industry interviews suggest that there is limited utility in attempting to generalize among topsides based on size and weight statistics and statistically linking this small sample to reported barge drafts and channel depths. The topsides are viewed as customized pieces of equipment that display considerable variation of weight within each grouping. Moreover, attempts to link topsides “size” to sailing draft requirements were very difficult because of industry preferences for ballasting. The industry interviews suggest that the maximum sailing draft of the barge is preferred for a reduced center of gravity.

However, it is necessary to assume some generalized relationship to facilitate the assignment of specific weight classes to channel depths. The subsequent analysis assumes the initially described relationship i.e. topsides weights of 9,000, 12,000, and 15,000 tons correspond to channel depth requirements of 16, 18 and 20 feet.

Table 21

Weight-Draft Relationship

Topside Installed Weight Category	Topside Tons Divided by Tons Per Foot	Topside Draft(ft)	Barge Draft(ft)	Trim Ballast(ft)	Total Draft(ft)	Channel Depth Range(ft)*
5,000 to 6,000	5,000-6,000/1,250	4-5	4	2-3	10-12	11-13
10,000 to 12,000	10,000-12,000/1,250	8-10	4	3-4	15-18	16-19
13,000 to 15,000	13,000-15,000/1,250	10-12	4	2-3	16-19	17-20
16,000 to 18,000	16,000-18,000/1,250	13-14	4	0-1	17-19	18-20

Source: Based on industry provided data

* Assuming a 1 foot under-keel clearance

Table 22
Load-Out Weight-Draft Relationship

Load-Out Weight (tons)	Topside Draft (ft)	Barge Draft (ft)	Ballast (ft)	Under-Keel Clearance (ft)	Channel Depth (ft)
9,000	7.2	4	3	1	15.2
12,000	9.6	4	3	1	17.6
15,000	12	4	3	1	20

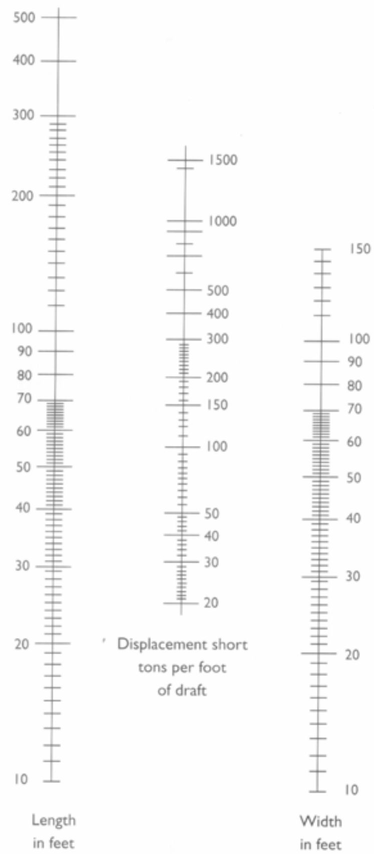
Note: Topside Draft estimate from Barge Displacement Calculator. 1,250 tons/ft.
Ballast estimates based on industry provided data.

Barge Displacement Calculator

To obtain displacement in tons per foot of draft, draw a line from the measurement for the length of the barge (see note) to the measurement for the width of the barge. The number obtained is then multiplied by the desired draft of the barge to obtain the capacity at that draft.

Light (empty) draft of most barges is approximately 1'6". This amount should be subtracted from the desired draft of the vessel before multiplying by the displacement figure, otherwise, the capacity arrived at will include the weight of the barge.

NOTE: For double-raked barges, subtract the length of one rake from the total length of the barge and use the resultant figure to determine displacement. For single-raked barges, subtract one-half the length of the rake from the total length of the barge and use this resultant figure to determine displacement.



20

Figure 16.

Source: Gulf Island (McDonough Marine)

VALUE OF TOPSIDES

The market values of deepwater topsides contracts to the fabricator were computed using an average contract value of $8,000 per fabricated ton, exclusive of the value of non-fabricated equipment such as pumps, living quarters, etc. The size (weight) of topsides from the perspective of the fabricator was assumed to be an average of 4,000 tons for TLPs, 6,000 tons for Spars, 8,000 tons for FPSOs, and 10,000 tons for FPSs (semisubmersible). The analysis makes a distinction between the topsides weight for fabrication and the topsides weight installed with all equipments, etc. The fabricator contract values are based on the fabrication weight rather than the installed (total) weight. The $8,000 fabricator value per ton was used rather than $7,000 per ton to reflect fabricator installation of non-fabricated accessories that add weight to the platform but do not correspondingly increase the value of the fabrication contract.

The $8,000 per fabricated ton value was applied to the reported typical average tonnages for deepwater topsides for different hulls.[22] Table 23 shows the annual and total fabrication contract values for deepwater topsides for a 16 foot channel and present value (discount rate of 5.125 percent) for POI under with project conditions.[23] For the “base case” of 25 percent POI market share (no increased competition or other market share scenarios), the total contract value for the period 2012 to 2050 is $504 million with a present value of $258 million. For the increased competition scenario, the total contract value is $444 million and the present value is $228 million. For the 20 percent EPC exclusionary procurements scenario, the total contract values are $403 and $355 million for no increased competition and increased competition, respectively, and the corresponding present values are $206 million and $182 million.

[22] As noted elsewhere in this report, there is a large range of topsides weights because of the variability of custom designed (one of a kind) facilities depending on production capabilities, equipment, etc. The averages used here reflect the typical sizes rather than the exceptional very large or very small weights from the perspective of the fabrication contract (excluding weight of installed equipment, etc.).

[23] As noted earlier, the contract values reflect market shares for fractional topsides (<1.0) in any particular year rather than cumulative whole units. Therefore, the tonnage values ($8,000) for any given year will not reflect a fully fabricated topsides but only the fractional portions thereof.

Table 23. POI Deepwater Topsides Fabrication Total Contract Values and Present Values ($000,000) for the 16 Foot Project

Staging														5 yrs		5 yrs	
Integration										50%		50%		50%		50%	
Contracts						80%		80%		80%		80%		80%		80%	
Competition		no		yes		no		yes		no		yes		no		yes	
Firms		2		2		2		2		2		2		2		2	
0.05125																	
	Year	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV
2012	1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2013	2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2014	3	$36	$31	$32	$28	$29	$25	$26	$22	$29	$25	$26	$22	$14	$12	$13	$11
2015	4	$44	$36	$39	$32	$35	$29	$31	$25	$32	$26	$28	$23	$18	$14	$16	$13
2016	5	$20	$16	$17	$13	$16	$12	$14	$11	$13	$10	$11	$9	$8	$6	$7	$5
2017	6	$24	$18	$22	$16	$19	$14	$17	$13	$19	$14	$17	$13	$19	$14	$17	$13
2018	7	$24	$17	$22	$15	$19	$14	$17	$12	$19	$14	$17	$12	$19	$14	$17	$12
2019	8	$12	$8	$11	$7	$10	$6	$9	$6	$10	$6	$9	$6	$10	$6	$9	$6
2020	9	$8	$5	$6	$4	$6	$4	$5	$3	$3	$2	$3	$2	$3	$2	$3	$2
2021	10	$12	$7	$11	$7	$10	$6	$9	$5	$10	$6	$9	$5	$10	$6	$9	$5
2022	11	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2023	12	$36	$20	$32	$18	$29	$16	$26	$14	$29	$16	$26	$14	$29	$16	$26	$14
2024	13	$16	$8	$13	$7	$13	$7	$10	$5	$6	$3	$5	$3	$6	$3	$5	$3
2025	14	$36	$18	$32	$16	$29	$14	$26	$13	$29	$14	$26	$13	$29	$14	$26	$13
2026	15	$22	$10	$19	$9	$17	$8	$15	$7	$15	$7	$14	$6	$15	$7	$14	$6
2027	16	$22	$10	$19	$9	$17	$8	$15	$7	$15	$7	$14	$6	$15	$7	$14	$6
2028	17	$22	$9	$19	$8	$17	$7	$15	$6	$15	$7	$14	$6	$15	$7	$14	$6
2029	18	$22	$9	$19	$8	$17	$7	$15	$6	$15	$6	$14	$6	$15	$6	$14	$6
2030	19	$22	$8	$19	$7	$17	$7	$15	$6	$15	$6	$14	$5	$15	$6	$14	$5
2031	20	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1	$2	$1	$3	$1	$2	$1
2032	21	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1	$2	$1	$3	$1	$2	$1
2033	22	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1	$2	$1	$3	$1	$2	$1
2034	23	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1	$2	$1	$3	$1	$2	$1
2035	24	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1	$2	$1	$3	$1	$2	$1
2036	25	$6	$2	$5	$1	$4	$1	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1
2037	26	$6	$2	$5	$1	$4	$1	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1
2038	27	$6	$1	$5	$1	$4	$1	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1
2039	28	$6	$1	$5	$1	$4	$1	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1
2040	29	$6	$1	$5	$1	$4	$1	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1
2041	30	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2042	31	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2043	32	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2044	33	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2045	34	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2046	35	$10	$2	$9	$2	$8	$1	$7	$1	$8	$1	$7	$1	$8	$1	$7	$1
2047	36	$10	$2	$9	$1	$8	$1	$7	$1	$8	$1	$7	$1	$8	$1	$7	$1
2048	37	$10	$2	$9	$1	$8	$1	$7	$1	$8	$1	$7	$1	$8	$1	$7	$1
2049	38	$10	$1	$9	$1	$8	$1	$7	$1	$8	$1	$7	$1	$8	$1	$7	$1
2050	39	$10	$1	$9	$1	$8	$1	$7	$1	$8	$1	$7	$1	$8	$1	$7	$1
Total		$504	$258	$444	$228	$403	$206	$355	$182	$365	$188	$324	$168	$331	$160	$294	$143

Notes: Values for "Total" and "PV" are rounded dollar values (millions) reflecting numbers of topsides under market share scenarios expressed in fractional units without rounding.

"Firms" refers to 2 fabricators of deepwater topsides at POI under with project conditions.

"Competition" refers to "yes" and "no" scenarios of increased foreign and domestic competition for deepwater topsides from other fabricators, exclusive of existing suppliers.

"Contracts" refers to percentage of awards for deepwater platforms constructed under all-inclusive bidding (not excluding small firms lacking EPC capabilities).

"Integration" refers to exclusion of a portion of non-SPAR topsides - 50% - (FPS, FPSO and TLP) from non-integrated firms lacking deepwater capabilities of the Texas yards for GIF and Kiewit.

"Staging" refers to major oil companies not awarding deepwater topsides contracts at POI until after first five years of the with project conditions.

Source: G.E.C., Inc.

For the 50 percent loss of share of dockside integrated topsides scenario (FPS, FPSO, and TLP hulls), the total contract values are $365 and $324 million for no increased competition and increased competition, respectively, and the corresponding present values are $188 million and $168 million. For the staging of awards scenario from major oil companies, the total contact values for two firms are $331 and $294 million for no increased competition and increased competition, respectively, and the corresponding present values are $160 million and $143 million.

Tables 24 and 25 contain the same sets of results of total contract values and present values for 18 and 20-foot channel depths. The results of tables 23, 24, and 25 are summarized in Table 26 below. Also shown in Table 26 are results for alternative scenarios regarding the overall size of the GOM topsides market.

The size of the GOM topsides market is the starting point for the scenario-specific POI topsides estimates in Table 19. As is the case with the POI market share, there is uncertainty associated with estimating the size of the GOM market. In an effort to address this uncertainty it was decided that multiple scenarios representing a range of possible values should be evaluated. Therefore, in addition to the Infield estimate of the GOM market, two additional estimates based on the MMS low forecast and MMS high forecast would be incorporated into the overall analysis.

The two forecast sources, Infield and MMS, do not provide the same level of detail. In order to facilitate a comparison it was decided that the results of the Infield-based contract values (Table 23 through Table 25) would be adjusted by the proportion of MMS to Infield total topsides. The MMS projections for deepwater activity, adjusted for the types of units that are of interest, totaled 47 and 76 units respectively, for the low and high projection cases over the 2012 to 2041 period (see Table 16.) The comparable number of units projected by Infield was 48. The low (47/48 = 0.98) and the high (76/48 = 1.58) ratios of MMS to Infield total topsides were used to scale the low and high MMS topsides estimates and ultimately the associated contract values. Contract values are summarized in Table 26. Note that the Infield and MMS composition of topsides and timing over the 2012 to 2041 period are not identical. Therefore, scaling the Infield results to reflect MMS based on total topsides for the period introduces some imprecision. It was decided that this imprecision was acceptable in order to facilitate the analysis given the inherent uncertainty associated with a scenario-based treatment of the overall GOM market size.

Table 24. Port of Iberia Deepwater Topsides Fabrication Total Contract Values and Present Values ($000,000) for Gulf of Mexico \With 18 Foot Project: 2012 to 2050

Staging														5 yrs		5 yrs	
Integration										50%		50%		50%		50%	
Contracts						80%		80%		80%		80%		80%		80%	
Competition		no		yes		no		yes		no		yes		no		yes	
Firms		2		2		2		2		2		2		2		2	
0.05125																	
	Year	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV
2012	1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2013	2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2014	3	$36	$31	$32	$28	$29	$25	$26	$22	$29	$25	$26	$22	$14	$12	$13	$11
2015	4	$44	$36	$39	$32	$35	$29	$31	$25	$32	$26	$28	$23	$18	$14	$16	$13
2016	5	$20	$16	$17	$13	$16	$12	$14	$11	$13	$10	$11	$9	$8	$6	$7	$5
2017	6	$24	$18	$22	$16	$19	$14	$17	$13	$19	$14	$17	$13	$19	$14	$17	$13
2018	7	$24	$17	$22	$15	$19	$14	$17	$12	$19	$14	$17	$12	$19	$14	$17	$12
2019	8	$12	$8	$11	$7	$10	$6	$9	$6	$10	$6	$9	$6	$10	$6	$9	$6
2020	9	$8	$5	$19	$12	$19	$12	$15	$10	$10	$6	$8	$5	$10	$6	$8	$5
2021	10	$12	$7	$11	$7	$10	$6	$9	$5	$10	$6	$9	$5	$10	$6	$9	$5
2022	11	$0	$0	$26	$15	$26	$15	$20	$12	$13	$7	$10	$6	$13	$7	$10	$6
2023	12	$36	$20	$32	$18	$29	$16	$26	$14	$29	$16	$26	$14	$29	$16	$26	$14
2024	13	$32	$17	$13	$7	$13	$7	$10	$5	$6	$3	$5	$3	$6	$3	$5	$3
2025	14	$36	$18	$32	$16	$29	$14	$26	$13	$29	$14	$26	$13	$29	$14	$26	$13
2026	15	$54	$25	$19	$9	$17	$8	$15	$7	$15	$7	$14	$6	$15	$7	$14	$6
2027	16	$22	$10	$19	$9	$17	$8	$15	$7	$15	$7	$14	$6	$15	$7	$14	$6
2028	17	$22	$9	$19	$8	$17	$7	$15	$6	$15	$7	$14	$6	$15	$7	$14	$6
2029	18	$22	$9	$19	$8	$17	$7	$15	$6	$15	$6	$14	$6	$15	$6	$14	$6
2030	19	$22	$8	$19	$7	$17	$7	$15	$6	$15	$6	$14	$5	$15	$6	$14	$5
2031	20	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1	$2	$1	$3	$1	$2	$1
2032	21	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1	$2	$1	$3	$1	$2	$1
2033	22	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1	$2	$1	$3	$1	$2	$1
2034	23	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1	$2	$1	$3	$1	$2	$1
2035	24	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1	$2	$1	$3	$1	$2	$1
2036	25	$6	$2	$5	$1	$4	$1	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1
2037	26	$6	$2	$5	$1	$4	$1	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1
2038	27	$6	$1	$5	$1	$4	$1	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1
2039	28	$6	$1	$5	$1	$4	$1	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1
2040	29	$6	$1	$5	$1	$4	$1	$4	$1	$3	$1	$3	$1	$3	$1	$3	$1
2041	30	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2042	31	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2043	32	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2044	33	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2045	34	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2046	35	$10	$2	$16	$3	$15	$3	$13	$2	$12	$2	$10	$2	$12	$2	$10	$2
2047	36	$10	$2	$16	$3	$15	$3	$13	$2	$12	$2	$10	$2	$12	$2	$10	$2
2048	37	$10	$2	$16	$3	$15	$2	$13	$2	$12	$2	$10	$2	$12	$2	$10	$2
2049	38	$10	$1	$16	$2	$15	$2	$13	$2	$12	$2	$10	$1	$12	$2	$10	$1
2050	39	$19	$3	$16	$2	$15	$2	$13	$2	$12	$2	$10	$1	$12	$2	$10	$1
Total		$562	$283	$521	$257	$480	$235	$417	$205	$403	$203	$355	$179	$370	$175	$325	$154

Notes: Values for "Total" and "PV" are rounded dollar values (millions) reflecting numbers of topsides under market share scenarios expressed in fractional units without rounding.

"Firms" refers to 2 fabricators of deepwater topsides at POI under with project conditions.

"Competition" refers to "yes" and "no" scenarios of increased foreign and domestic competition for deepwater topsides from other fabricators, exclusive of existing suppliers.

"Contracts" refers to percentage of awards for deepwater platforms constructed under all-inclusive bidding (not excluding small firms lacking EPC capabilities).

"Integration" refers to exclusion of a portion of non-SPAR topsides - 50% - (FPS, FPSO and TLP) from non-integrated firms lacking deepwater capabilities of the Texas yards for GIF and Kiewit.

"Staging" refers to major oil companies not awarding deepwater topsides contracts at POI until after first five years of the with project conditions.

Source: G.E.C., Inc.

Table 25.

Port of Iberia Deepwater Topsides Fabrication Total Contract Values and Present Values for Gulf of Mexico \With 20 Foot Project: 2012 to 2050

(000,000)

Staging														5 yrs		5 yrs	
Integration										50%		50%		50%		50%	
Contracts						80%		80%		80%		80%		80%		80%	
Competition		no		yes		no		yes		no		yes		no		yes	
Firms		2		2		2		2		2		2		2		2	
0.05125																	
	Year	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV	Total	PV
2012	1	$20	$19	$16	$15	$16	$15	$13	$12	$8	$8	$6	$6	$8	$8	$6	$6
2013	2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2014	3	$36	$31	$32	$28	$29	$25	$26	$22	$29	$25	$26	$22	$14	$12	$13	$11
2015	4	$44	$36	$39	$32	$35	$29	$31	$25	$32	$26	$28	$23	$18	$14	$16	$13
2016	5	$20	$16	$17	$13	$16	$12	$14	$11	$13	$10	$11	$9	$8	$6	$7	$5
2017	6	$44	$33	$38	$28	$35	$26	$30	$22	$27	$20	$24	$18	$27	$20	$24	$18
2018	7	$24	$17	$22	$15	$19	$14	$17	$12	$19	$14	$17	$12	$19	$14	$17	$12
2019	8	$12	$8	$11	$7	$10	$6	$9	$6	$10	$6	$9	$6	$10	$6	$9	$6
2020	9	$24	$15	$19	$12	$19	$12	$15	$10	$10	$6	$8	$5	$10	$6	$8	$5
2021	10	$32	$19	$27	$16	$26	$16	$21	$13	$18	$11	$15	$9	$18	$11	$15	$9
2022	11	$32	$18	$26	$15	$26	$15	$20	$12	$13	$7	$10	$6	$13	$7	$10	$6
2023	12	$36	$20	$32	$18	$29	$16	$26	$14	$29	$16	$26	$14	$29	$16	$26	$14
2024	13	$16	$8	$13	$7	$13	$7	$10	$5	$6	$3	$5	$3	$6	$3	$5	$3
2025	14	$36	$18	$32	$16	$29	$14	$26	$13	$29	$14	$26	$13	$29	$14	$26	$13
2026	15	$22	$10	$19	$9	$17	$8	$15	$7	$15	$7	$14	$6	$15	$7	$14	$6
2027	16	$22	$10	$19	$9	$17	$8	$15	$7	$15	$7	$14	$6	$15	$7	$14	$6
2028	17	$22	$9	$19	$8	$17	$7	$15	$6	$15	$7	$14	$6	$15	$7	$14	$6
2029	18	$22	$9	$19	$8	$17	$7	$15	$6	$15	$6	$14	$6	$15	$6	$14	$6
2030	19	$22	$8	$19	$7	$17	$7	$15	$6	$15	$6	$14	$5	$15	$6	$14	$5
2031	20	$8	$3	$7	$2	$6	$2	$5	$2	$4	$2	$4	$1	$4	$2	$4	$1
2032	21	$8	$3	$7	$2	$6	$2	$5	$2	$4	$1	$4	$1	$4	$1	$4	$1
2033	22	$8	$3	$7	$2	$6	$2	$5	$2	$4	$1	$4	$1	$4	$1	$4	$1
2034	23	$8	$3	$7	$2	$6	$2	$5	$2	$4	$1	$4	$1	$4	$1	$4	$1
2035	24	$8	$2	$7	$2	$6	$2	$5	$2	$4	$1	$4	$1	$4	$1	$4	$1
2036	25	$10	$3	$8	$2	$8	$2	$6	$2	$5	$1	$4	$1	$5	$1	$4	$1
2037	26	$10	$3	$8	$2	$8	$2	$6	$2	$5	$1	$4	$1	$5	$1	$4	$1
2038	27	$10	$2	$8	$2	$8	$2	$6	$2	$5	$1	$4	$1	$5	$1	$4	$1
2039	28	$10	$2	$8	$2	$8	$2	$6	$2	$5	$1	$4	$1	$5	$1	$4	$1
2040	29	$10	$2	$8	$2	$8	$2	$6	$1	$5	$1	$4	$1	$5	$1	$4	$1
2041	30	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2042	31	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2043	32	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2044	33	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2045	34	$6	$1	$6	$1	$5	$1	$4	$1	$4	$1	$4	$1	$4	$1	$4	$1
2046	35	$19	$3	$16	$3	$15	$3	$13	$2	$12	$2	$10	$2	$12	$2	$10	$2
2047	36	$19	$3	$16	$3	$15	$3	$13	$2	$12	$2	$10	$2	$12	$2	$10	$2
2048	37	$19	$3	$16	$3	$15	$2	$13	$2	$12	$2	$10	$2	$12	$2	$10	$2
2049	38	$19	$3	$16	$2	$15	$2	$13	$2	$12	$2	$10	$1	$12	$2	$10	$1
2050	39	$19	$3	$16	$2	$15	$2	$13	$2	$12	$2	$10	$1	$12	$2	$10	$1
Total		$700	$352	$601	$303	$560	$282	$481	$242	$443	$226	$387	$198	$410	$198	$357	$173

Notes: Values for "Total" and "PV" are rounded dollar values (millions) reflecting numbers of topsides under market share scenarios expressed in fractional units without rounding.

"Firms" refers to 2 fabricators of deepwater topsides at POI under with project conditions.

"Competition" refers to "yes" and "no" scenarios of increased foreign and domestic competition for deepwater topsides from other fabricators, exclusive of existing suppliers.

"Contracts" refers to percentage of awards for deepwater platforms constructed under all-inclusive bidding (not excluding small firms lacking EPC capabilities).

"Integration" refers to exclusion of a portion of non-SPAR topsides - 50% - (FPS, FPSO and TLP) from non-integrated firms lacking deepwater capabilities of the Texas yards for GIF and Kiewit.

"Staging" refers to major oil companies not awarding deepwater topsides contracts at POI until after first five years of the with project conditions.

Source: G.E.C., Inc.

Table 26. POI Topsides Contract Present Values for Market Scenarios
(5.125 interest rate, millions of dollars)

Scenario	Infield GOM Market		MMS High GOM Market		MMS Low GOM Market	
Competition	No Increased Competition	Increased Competition	No Increased Competition	Increased Competition	No Increased Competition	Increased Competition
16 Foot Channel	$ 258	$ 228	$ 409	$ 361	$ 253	$ 223
18 Foot Channel	$ 283	$ 257	$ 448	$ 407	$ 277	$ 252
20 Foot Channel	$ 352	$ 303	$ 557	$ 480	$ 345	$ 297
20 Percent EPC						
16 Foot Channel	$ 206	$ 182	$ 326	$ 288	$ 202	$ 178
18 Foot Channel	$ 235	$ 205	$ 372	$ 325	$ 230	$ 201
20 Foot Channel	$ 282	$ 242	$ 447	$ 383	$ 276	$ 237
50 Percent Integration						
16 Foot Channel	$ 188	$ 168	$ 298	$ 266	$ 184	$ 165
18 Foot Channel	$ 203	$ 179	$ 321	$ 283	$ 199	$ 175
20 Foot Channel	$ 226	$ 198	$ 358	$ 314	$ 221	$ 194
Staging						
16 Foot Channel	$ 160	$ 143	$ 253	$ 226	$ 157	$ 140
18 Foot Channel	$ 175	$ 154	$ 277	$ 244	$ 171	$ 151
20 Foot Channel	$ 198	$ 173	$ 314	$ 274	$ 194	$ 169

Note: The market share effects are sequential and cumulative rather than independent of each other.

SECTION 3: Project Costs And Economic Justification

PROJECT COSTS

FIRST COSTS

Project construction expenditures by year in 2004 dollars are displayed in Table 27. Total construction cost is estimated to be $203 million for the 20-foot channel, $179 million for the 18-foot channel, and $156 million for the 16-foot channel, which will be spent over a 5-year period beginning in year 2007.

These estimates are primarily comprised of the cost of dredging the Commercial Canal, GIWW, Freshwater Bayou, Freshwater By-Pass and Bar Channels to the desired depth. In addition, total project cost also includes the cost of replacing bulkheads required for facilities to continue to operate along the proposed deeper channels, the construction of a floodgate in the Freshwater By-Pass Channel, and the removal and relocation of several liquid and natural gas pipelines. Project implementation is not expected to result in adverse impacts to the natural environment. Therefore, mitigation costs are assumed to be zero.

ANNUAL OPERATION AND MAINTENANCE COSTS

These include the cost of maintenance dredging of the above-mentioned waterways, bank rock maintenance, as well as the cost of operating and maintaining the floodgate. O&M costs displayed are the total O&M costs for each channel depth including the increment associated with the existing channel.

AVERAGE ANNUAL COSTS

Table 28 displays the composition of the total first cost estimate for each alternative, the present value cost, and lastly, the average annual cost associated with each cost item.

All costs in Table 28 represent 2004 price levels. Present value and annual cost estimates were calculated using an interest rate of 5.125 percent, and a 50-year amortization period. Project base year is 2012, the first year project benefits would be generated and the common reference point for present value computation for all benefits and costs.

ECONOMIC JUSTIFICATION

The present value estimates of contract values by GOM market size and POI market share scenario as shown in Table 26 were also annualized using an interest rate of 5.125 percent and a 50-year amortization period. Table 29 displays these results. Net benefits, representing the difference between the incremental average annual benefits and incremental average annual costs were calculated for each alternative channel depth and are displayed in Table 30 by GOM market size and POI market share scenario. The resulting benefit to cost ratios (BCR) are displayed in Table 31.

Relative performance of alternatives should be viewed within the context of a set of conditions that define a particular scenario. For example, for the Infield projected GOM market, no increased competition condition, the topsides contract annual benefits for the 16 foot, 18 foot, and 20 foot alternatives are $14.406 million, $15.802 million, and $19.655 million respectively (Table 29); net benefits for the no increased competition condition for the 16 foot, 18 foot, and 20 foot alternatives are $3.274 million, $2.982 million, and $4.702 million (Table 30).

Table 27. Construction Expenditures by Year
(2004 Prices, $1,000)

Year	Construction Costs 20'	18'	16'
2007	29,505	23,342	16,588
2008	30,188	25,270	20,466
2009	41,067	37,392	34,540
2010	41,067	37,392	34,540
2011	61,018	55,847	49,401
Total	202,844	179,244	155,535

Table 28. Cost Summary
(2004 $1,000, 5.125 Percent)

	20'	18'	16'
Construction Costs	202,844	179,244	155,535
P.V. Construction Costs	220,679	194,343	167,918
Interest During Construction	17,835	15,101	12,383
Annual Construction Costs	12,322	10,852	9,376
Annual O&M Costs	3,699	3,036	2,824
Total Annual Cost	16,021	13,888	12,200
Base Year	2012	2012	2012

Table 29. Average Annual Benefits
(5.125 interest rate, thousands of dollars)

Scenario	Infield GOM Market		MMS High GOM Market		MMS Low GOM Market	
Competition	No Increased Competition	Increased Competition	No Increased Competition	Increased Competition	No Increased Competition	Increased Competition
16 Foot Channel	14,406	12,731	22,810	20,158	14,106	12,466
18 Foot Channel	15,802	14,350	25,020	22,721	15,473	14,051
20 Foot Channel	19,655	16,919	31,120	26,788	19,246	16,566
20 Percent EPC						
16 Foot Channel	11,503	10,163	18,213	16,091	11,263	9,951
18 Foot Channel	13,122	11,447	20,776	18,124	12,849	11,208
20 Foot Channel	15,746	13,513	24,932	21,395	15,418	13,231
50 Percent Integration						
16 Foot Channel	10,498	9,381	16,621	14,853	10,279	9,185
18 Foot Channel	11,335	9,995	17,947	15,825	11,099	9,787
20 Foot Channel	12,619	11,056	19,981	17,505	12,356	10,826
Staging						
16 Foot Channel	8,934	7,985	14,146	12,643	8,748	7,818
18 Foot Channel	9,772	8,599	15,472	13,615	9,568	8,420
20 Foot Channel	11,056	9,660	17,505	15,295	10,826	9,459

Note: The market share effects are sequential and cumulative rather than independent of each other.

Table 30. Average Annual Net Benefits
(5.125 interest rate, thousands of dollars)

Scenario	Infield GOM Market		MMS High GOM Market		MMS Low GOM Market	
Competition	No Increased Competition	Increased Competition	No Increased Competition	Increased Competition	No Increased Competition	Increased Competition
16 Foot Channel	3,274	1,599	11,678	9,026	2,974	1,334
18 Foot Channel	2,982	1,530	12,200	9,902	2,653	1,232
20 Foot Channel	4,702	1,965	16,167	11,835	4,292	1,613
20 Percent EPC						
16 Foot Channel	371	(969)	7,081	4,959	131	(1,181)
18 Foot Channel	302	(1,373)	7,957	5,304	29	(1,612)
20 Foot Channel	793	(1,441)	9,978	6,442	465	(1,722)
50 Percent Integration						
16 Foot Channel	(634)	(1,751)	5,489	3,721	(853)	(1,946)
18 Foot Channel	(1,485)	(2,825)	5,127	3,006	(1,721)	(3,033)
20 Foot Channel	(2,334)	(3,898)	5,027	2,552	(2,597)	(4,128)
Staging						
16 Foot Channel	(2,198)	(3,147)	3,014	1,511	(2,384)	(3,313)
18 Foot Channel	(3,048)	(4,221)	2,652	795	(3,252)	(4,400)
20 Foot Channel	(3,898)	(5,293)	2,552	342	(4,128)	(5,495)

Note: In addition to Fabrication benefits, benefits are claimed from savings of existing channel O&M that would be avoided. These annual O&M savings are $1,068,000 and reflected in the net benefits for all alternatives. The market share effects are sequential and cumulative rather than independent of each other.

Table 31. Benefit to Cost Ratios

Scenario	Infield GOM Market		MMS High GOM Market		MMS Low GOM Market	
Competition	No Increased Competition	Increased Competition	No Increased Competition	Increased Competition	No Increased Competition	Increased Competition
16 Foot Channel	1.29	1.14	2.05	1.81	1.27	1.12
18 Foot Channel	1.23	1.12	1.95	1.77	1.21	1.10
20 Foot Channel	1.31	1.13	2.08	1.79	1.29	1.11
20 Percent EPC						
16 Foot Channel	1.03	0.91	1.64	1.45	1.01	0.89
18 Foot Channel	1.02	0.89	1.62	1.41	1.00	0.87
20 Foot Channel	1.05	0.90	1.67	1.43	1.03	0.88
50 Percent Integration						
16 Foot Channel	0.94	0.84	1.49	1.33	0.92	0.83
18 Foot Channel	0.88	0.78	1.40	1.23	0.87	0.76
20 Foot Channel	0.84	0.74	1.34	1.17	0.83	0.72
Staging						
16 Foot Channel	0.80	0.72	1.27	1.14	0.79	0.70
18 Foot Channel	0.76	0.67	1.21	1.06	0.75	0.66
20 Foot Channel	0.74	0.65	1.17	1.02	0.72	0.63

Note: The market share effects are sequential and cumulative rather than independent of each other.